OUR ROADS

MODERN INDIA SERIES

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MINISTRY OF INFORMATION AND BROADCASTIN(
GOVERNMENT OF INDIA

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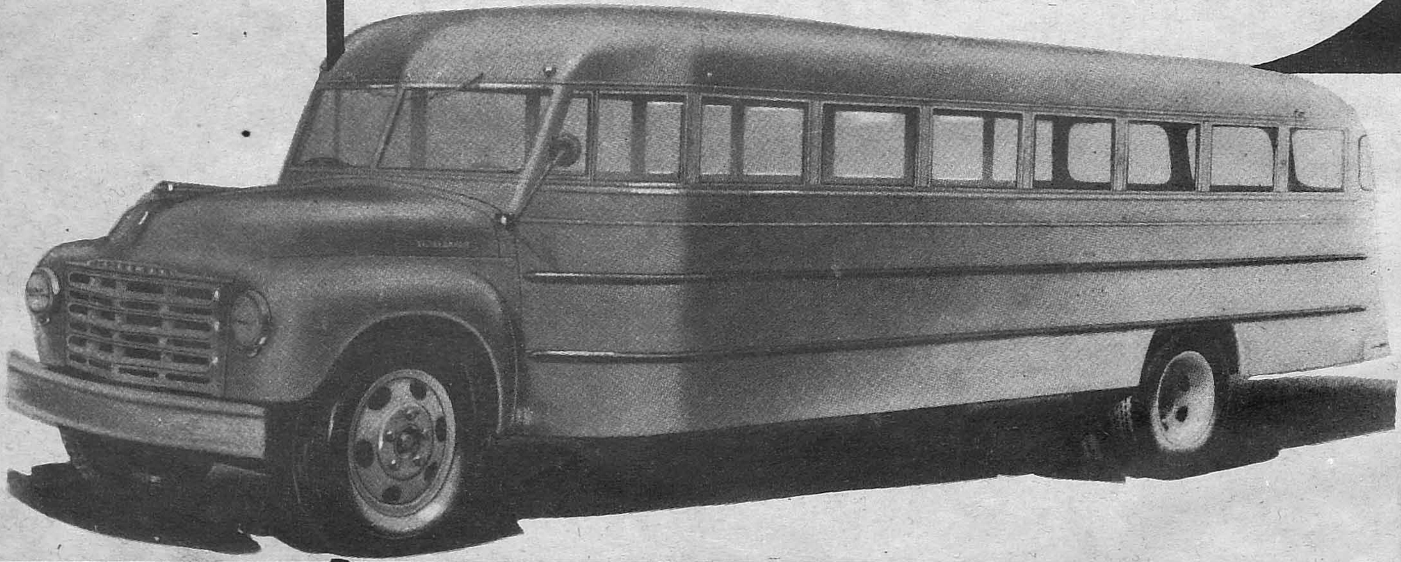
INDIA LOOKS FORWARD TO

1949 Studebaker BUS

STURDY AS A TRUCK
COMFORTABLE AS A LIMOUSINE



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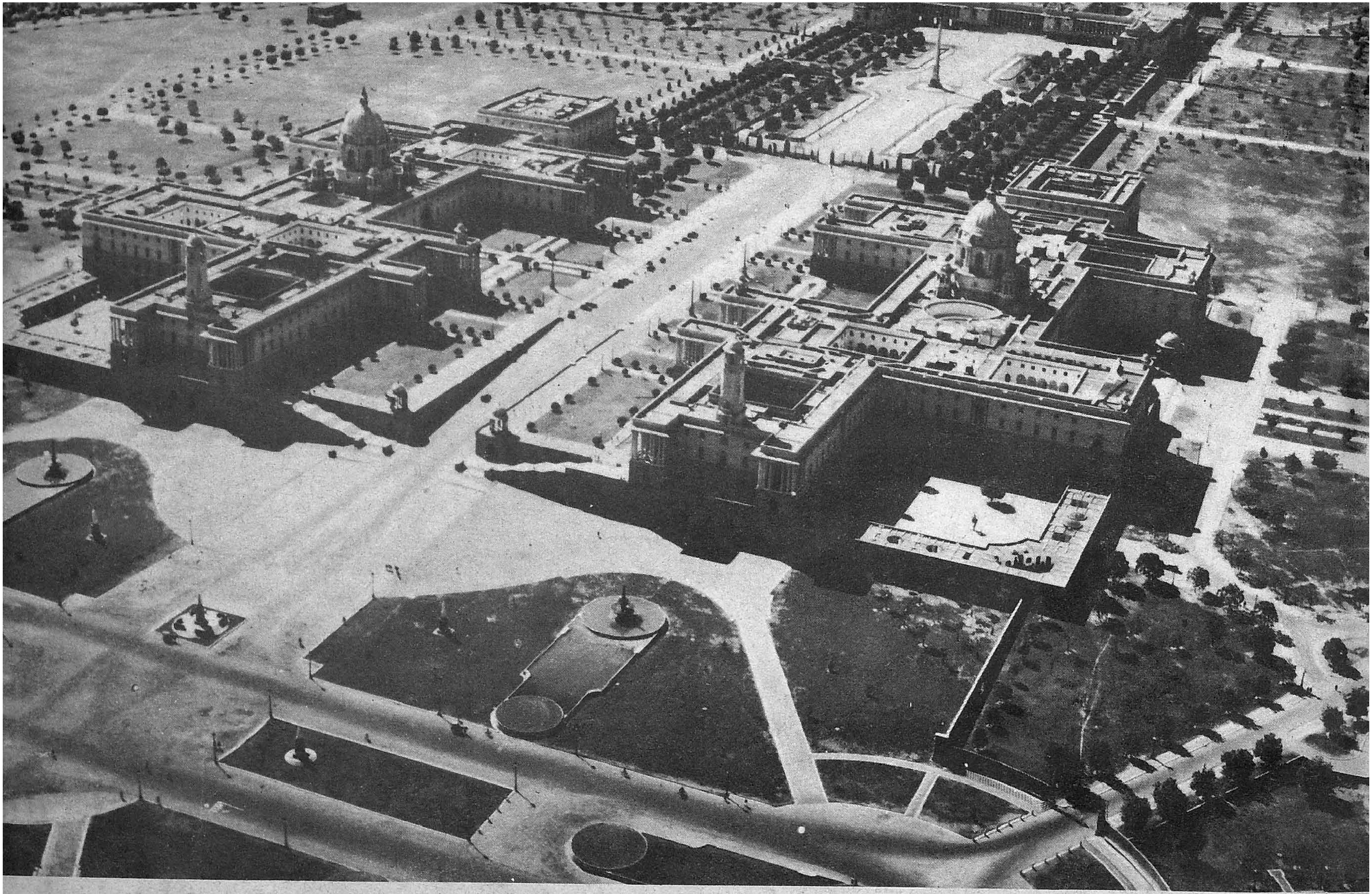
CONTENTS

Chapter		Page
I	National Importance of Roads	5
II	Wanted More Roads	11
III	Highways of History	17
IV	One Hundred Years of Retarded Progress	22
V	The Nagpur Plan	27
VI	Forging Ahead	30
VII	The Central Roads Organisation	35
VIII	Cost and Benefits	41
IX	The Picture Today	45
X	The Bullock Cart and the Motor Vehicle	51
	Road Statistics	57

Marine Drive, Bombay



Aerial view of New Delhi showing the Capital's well-planned and broad avenues
Photograph: Air Survey Co., Ltd., Dum Dum

NATIONAL IMPORTANCE OF ROADS

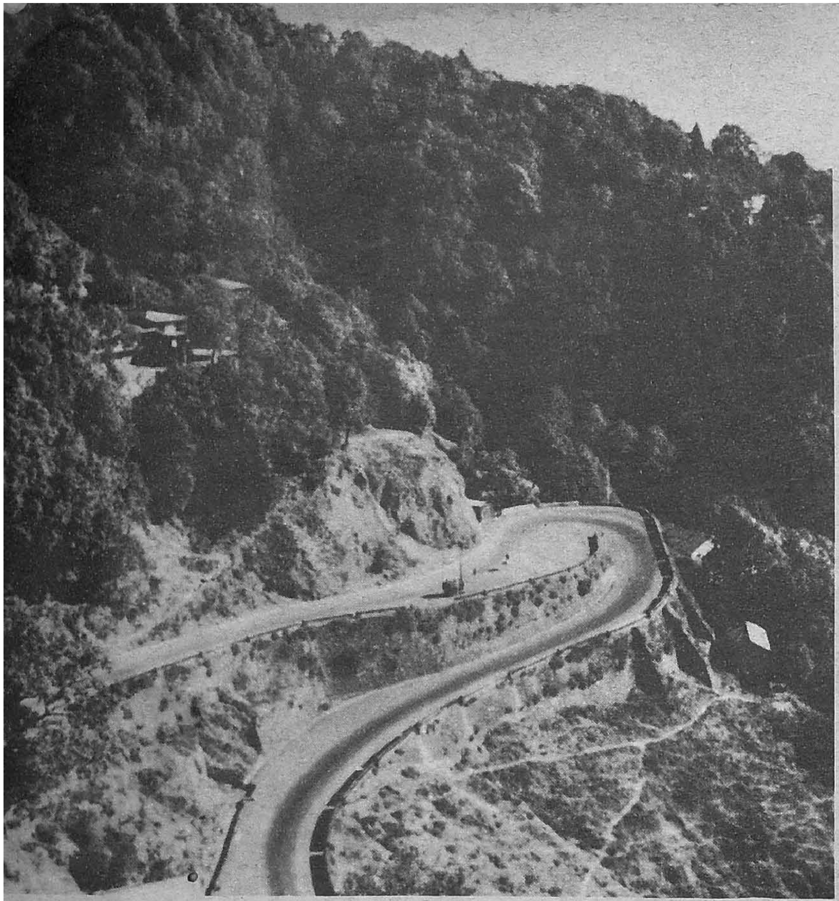
CHAPTER I

ROADS in a country have been aptly compared to arteries in a human body. Just as the latter keep the health of the body by enabling circulation of blood, similarly roads promote national prosperity by keeping people and goods moving.

No one in a civilised society can do without roads. The tiller of the soil needs good roads to transport his produce from his field to marketing centres. Roads are equally vital to the townsmen. The businessman dashing about in his sleek limousine, the doctor rushing to see his patient, the teacher going to school by bus, the clerk cycling to his office and the workman proceeding to his place of work on foot require roads, more roads, and better roads. Imagine what annoyance, what mental agony they will suffer if they have to negotiate bad, uneven, and dusty roads.

Because bad roads cause them personal inconvenience people will acknowledge that they deserve some attention. The real importance of roads to the country and the community as a whole is, however, not always realised. A better and more widespread appreciation of our road problem is not only desirable but necessary if our visions of a new, happy and prosperous India are to take shape.

The nation is busy with the task of material and moral reconstruction. Plans have been made to harness rivers, modernize agriculture, and expand industries. In any comprehensive scheme of development, however, road development must have a first priority. For as the Hon'ble Minister for Transport, Dr. John Matthai, pointed out in his message to the Indian Roads Congress recently, " If the manifold resources and teeming man-power of our country are to be utilised for the benefit of the common man they must be harnessed to the



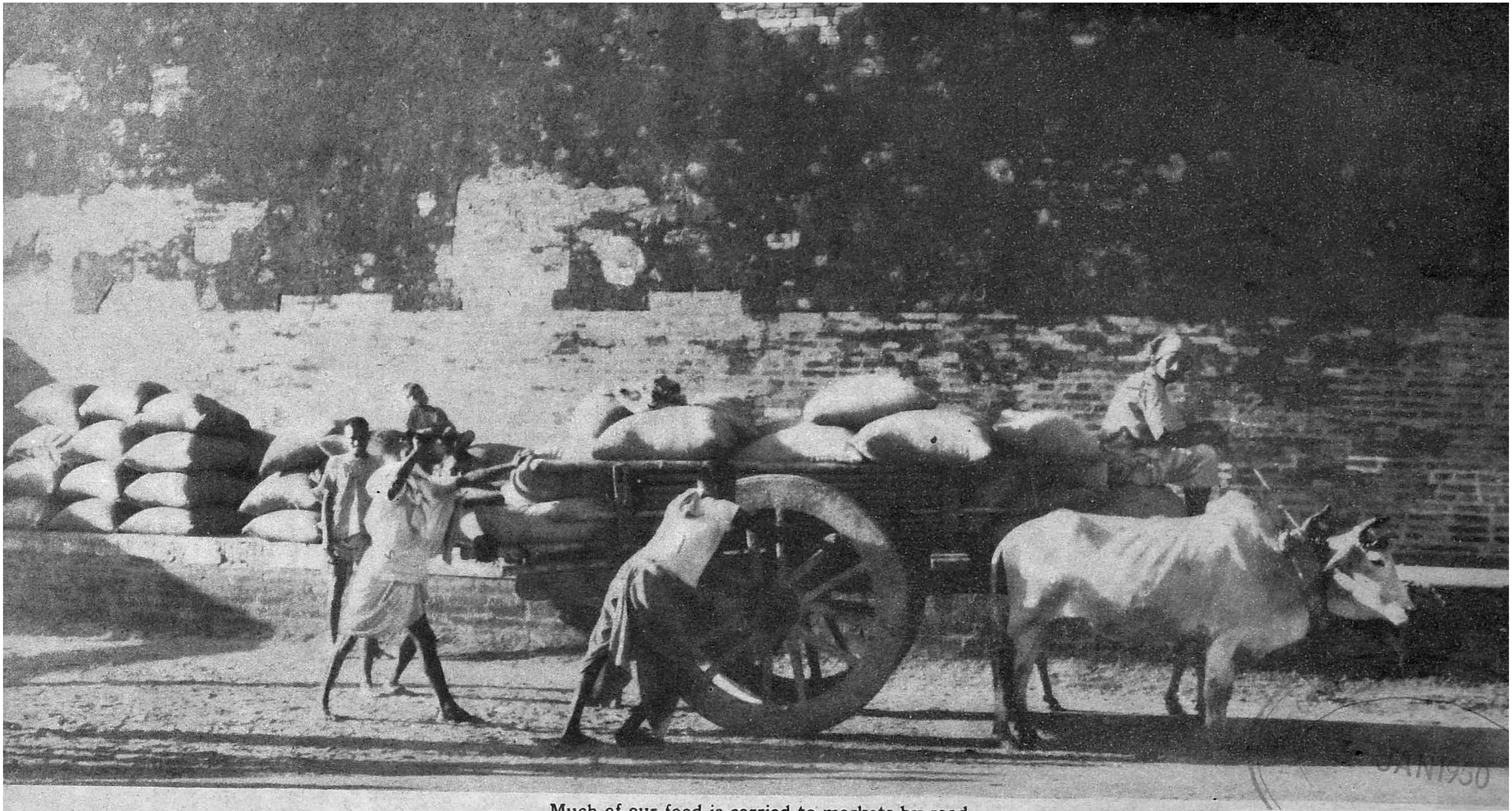
Meandering road to the cool heights of Mussoorie

chariot of production and move along the lines of communications, particularly road communications."

The solution of many of our national problems depends on the provision of good roads. Let us, for example, consider the importance of roads in the context of the food problem. The key to the solution of the problem lies in more food production and better distribution. Both production and distribution are in their turn dependent on road development. Extension of our road system will enable us not only to bring under cultivation large tracts of fertile land, which are not being put to any use, but also help increase the productive capacity of our existing agricultural land. The importance of roads in the task of food distribution was underlined when the Hon'ble Minister for Food recently stated that there was enough food to go round, and if it could be moved speedily when and where required there need be no anxiety regarding the food situation.

•

Our plans of rural reconstruction too are linked up with road development. More roads will enable the farmer to produce vegetables, fruit, milk and dairy products, market them in good condition and make good profits. With better income he will be in a position to buy seeds, implements and manures and effect improvements in his fields.



Much of our food is carried to markets by road

Roads have a cultural aspect also which deserves consideration. A large part of our population is ignorant and ill-informed because it lives in villages not well-connected with urban areas. Improved communications will enable the villager to move about and educate himself by travelling. Mobile libraries, newspapers and magazines will bring him news from all parts of the country, and make him an active and alert member of the community. Contacts with other people and interchange of ideas will make him better appreciate and understand other parts of the country, thereby strengthening national unity.

Good roads help the Army move faster

Roads have a vital role to play in the defence of India. Ours is a vast country and it is not practicable to post military units at every point throughout the length and breadth of the land. The effectiveness of defence, therefore, depends on the ability of our armed forces to concentrate at any threatened point within the shortest possible time. Armed forces are now mechanised and move on wheels, and wheels require roads to run on. In the final analysis, therefore, the effectiveness of our defence to a large extent depends on the efficiency of our road system.

The majority of non-Muslim refugees were evacuated from Pakistan by road

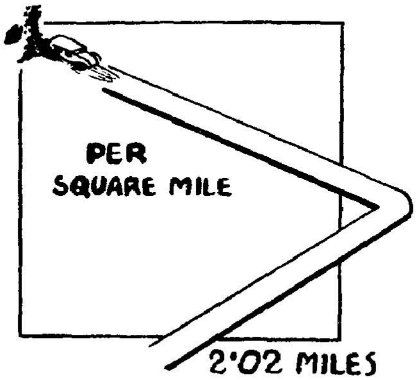
Lastly, roads are the symbol of a country's progress. "If you wish to know," says a well-known American thinker, " whether society is stagnant, you may learn something by going into universities and libraries; something also by the work that is doing on cathedrals and churches, or in them; but quite as much by looking at the roads. For if there is any motion in society, the Road, which is the symbol of motion, will indicate the fact. When there is activity and enlargement or a liberalizing spirit of any kind, then there is intercourse and travel, and these require roads. So if there is any kind of advancement going on, if new ideas are abroad and new hopes rising, then you will see it by the roads that are building. Nothing makes an inroad without making a road. All creative action, whether in government, industry, thought or religion, creates roads."

To pilgrimage by road

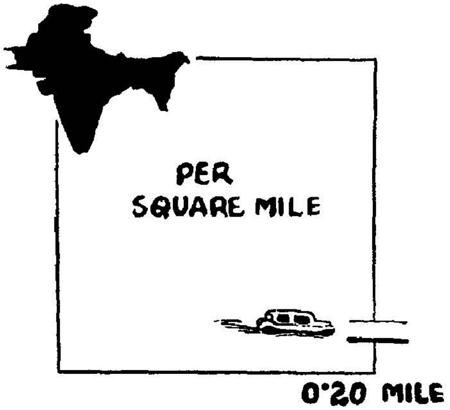
WANTED MORE ROADS

CHAPTER II

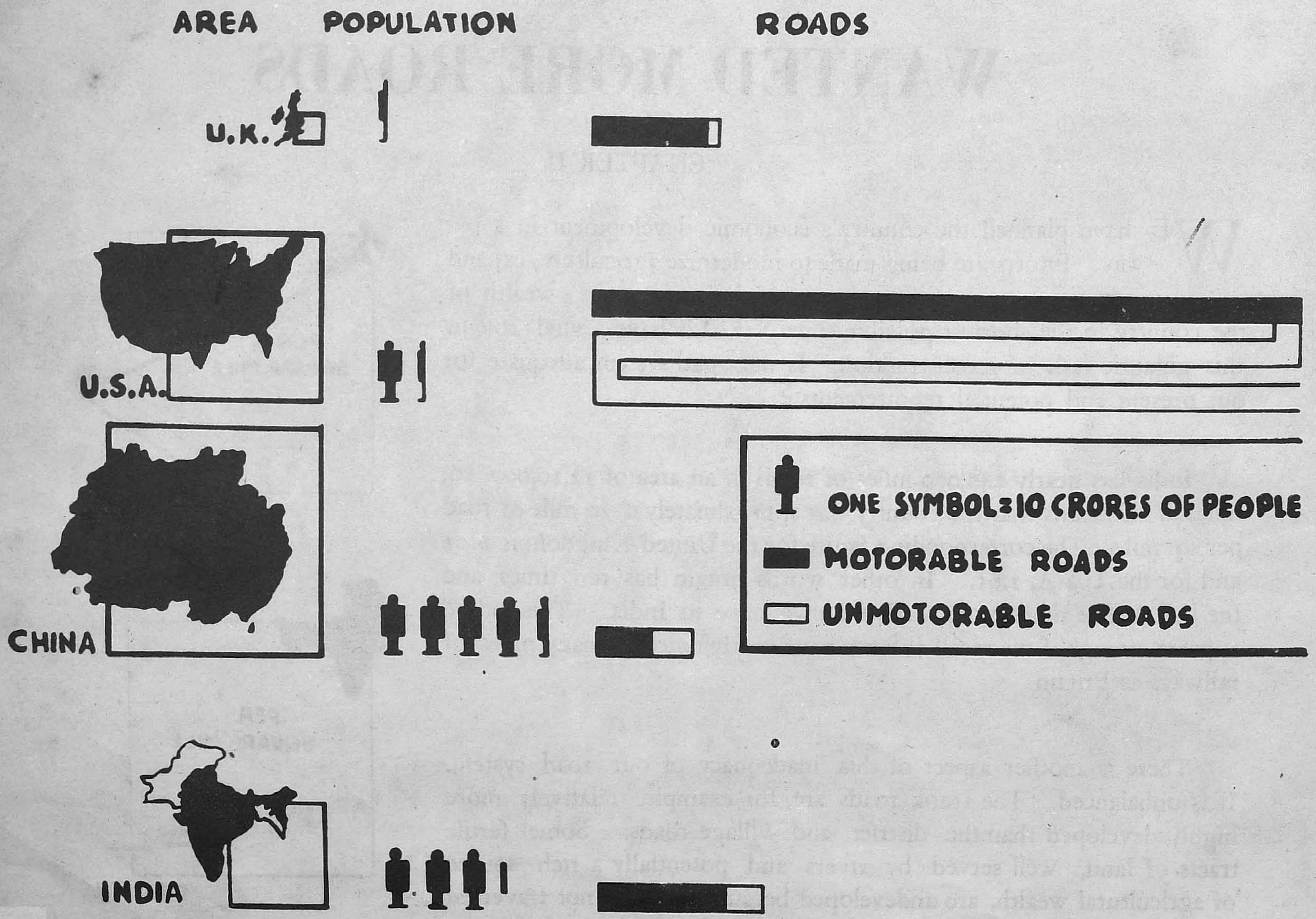
WE have planned the country's economic development in a big way. Efforts are being made to modernize agriculture, expand industries, mechanise transport and increase the wealth of the country in the shortest possible time. Roads have a vital role in this gigantic task of reconstruction. Is our road system adequate for our present and potential requirements?



India has nearly 240,000 miles of roads in an area of 12,10,000 sq. miles. This means that the country has approximately 0.20 mile of road per sq. mile. The corresponding figure for the United Kingdom is 2.02 and for the U.S.A. 1.01. In other words Britain has ten times and the U.S.A. five times more roads than we have in India. This indeed appears strange if we recall that we have nearly twice as many miles of railways as Britain.

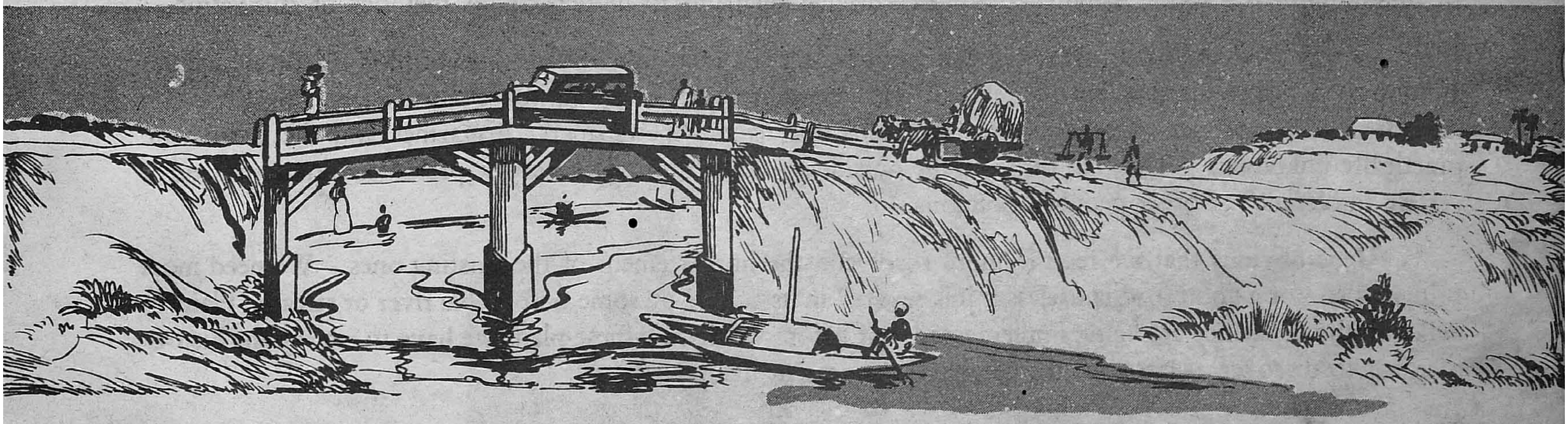


There is another aspect of this inadequacy of our road system. It is unbalanced. The trunk roads are, for example, relatively more highly developed than the district and village roads. Some fertile tracts of land, well served by rivers and potentially a rich source of agricultural wealth, are undeveloped because they are not traversed


AREA
POPULATION
ROADS
U.K.
U.S.A.
CHINA
INDIA
ONE SYMBOL=10 CRORES OF PEOPLE
MOTORABLE ROADS
UNMOTORABLE ROADS

by roads. A very large number of our villages are not connected by road with any urban centre or railway station. Most of the existing village roads are fair-weather roads which, when the monsoon arrives, are turned into mud, slush, pools of dirty water and become unusable. There are few permanent bridges and culverts and consequently each *nullah* is an insurmountable obstacle in the rainy season.

There is an American slogan that " the community pays for good roads whether it has them or not, it pays more if it has not got them. " We in India are paying heavily for not having enough good roads in our rural areas. The backward state of our agriculture and agricultural population can be attributed to poor communications. With roads as they are the agriculturist cannot market his produce speedily and in good condition. Therefore, generally he grows only such crops as do not deteriorate quickly. Vegetables, fruit,



Indian Army sappers repairing a road to speed up military traffic

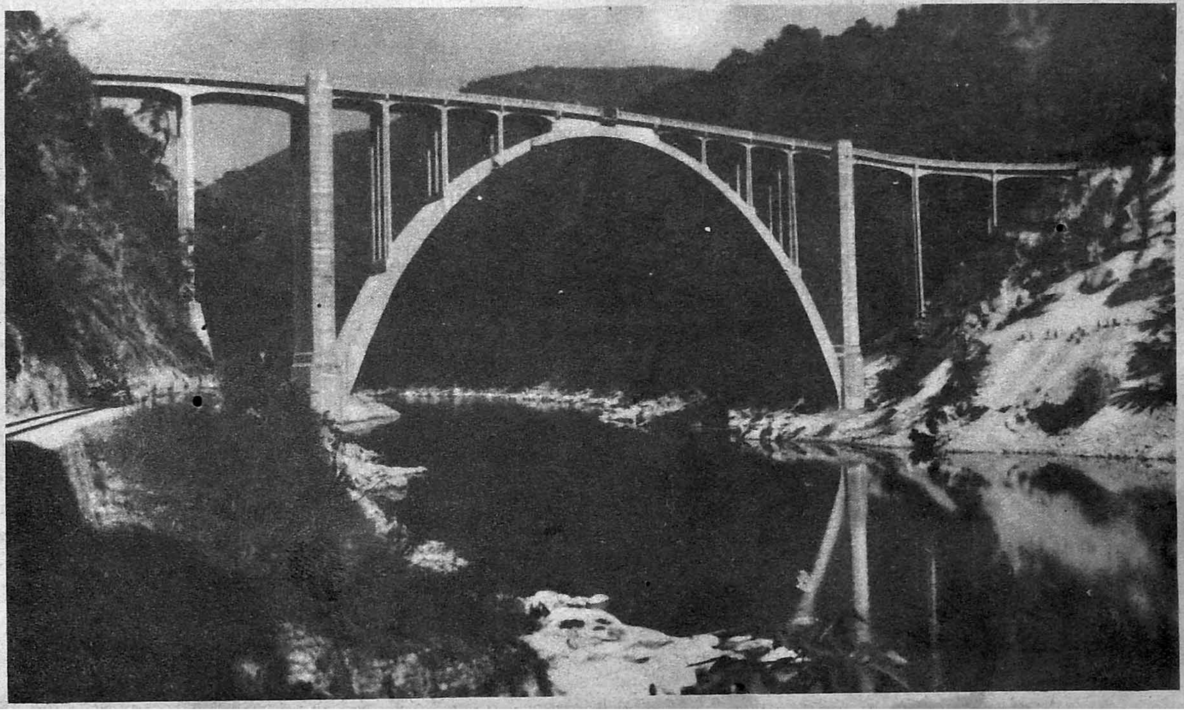
Tanks can do without good roads but not without bridges

dairy and poultry products are produced only by the fortunate few who are able to transport these perishable products speedily to the market, but it is claimed that nearly half of such perishable produce of India deteriorates owing to delay in marketing. The cultivator is poorly rewarded for his labour and he is not in a position to obtain improved seeds, manures and agricultural implements to modernize his methods of cultivation.

Away from the urban areas the cultivator lacks even the ordinary amenities of life. Medical facilities are non-existent in a large majority of the villages, maternity risks are great, infant mortality is high, education is scanty. The postman does not visit the cultivator daily. Newspapers, magazines and the cinema are practically unknown. Thus cut off from the outside world he develops a narrow prejudiced outlook and a certain intolerance of other people's opinions.

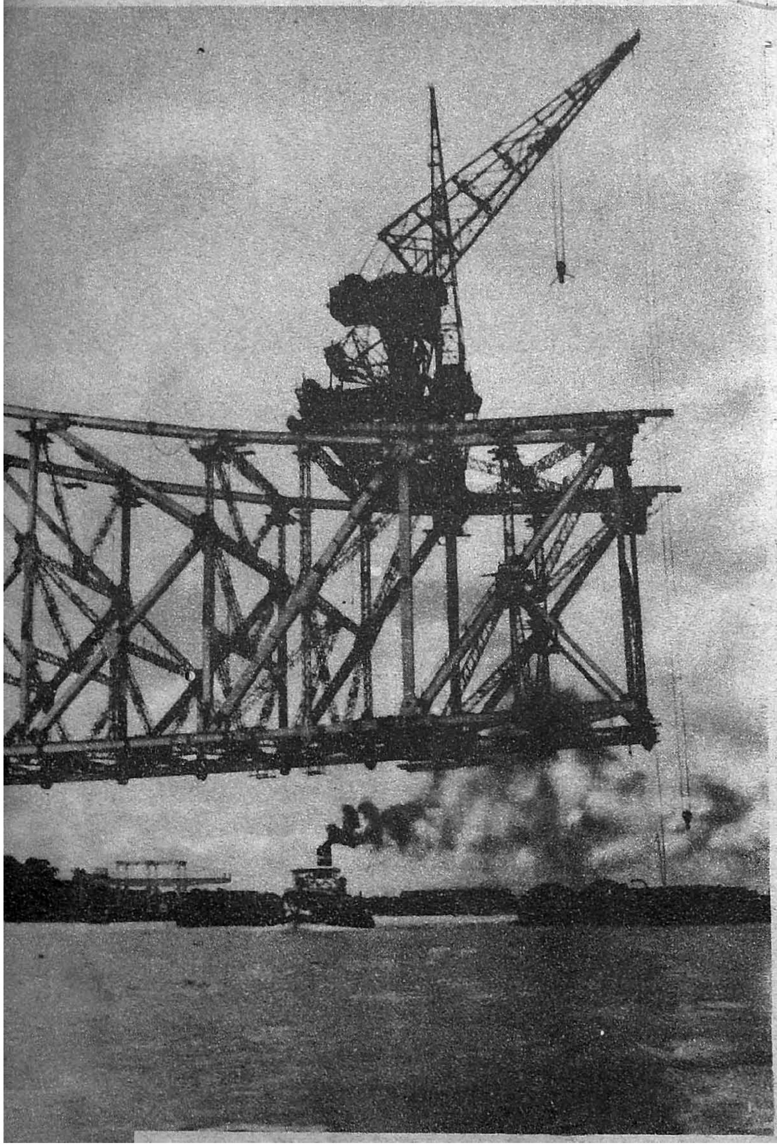
It is obvious that we require more roads and the improvement of the existing ones. We need more bridges also, for a good road is useless if it is severed in its course by some unfordable river or stream. Plans to make up the deficiency are being implemented, but before we discuss these plans we have to survey the history of roads to discover, if possible, the causes of the present inadequacy.

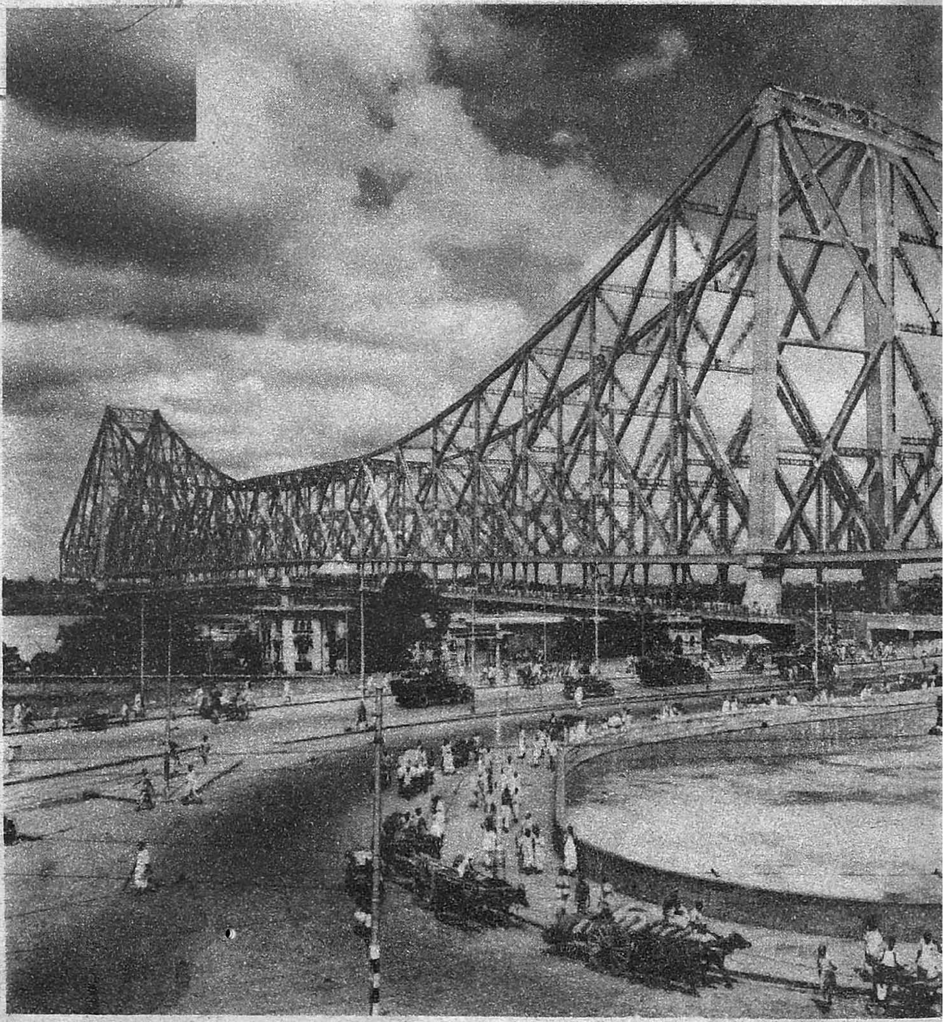
This bridge spans the Ganges near Kanpur
Photographed by Air Survey Co., Ltd , Dum Dum



Coronation bridge over
the river Teesta

The New Howrah Bridge under construction





The New Howrah Bridge, a marvel of engineering skill

HIGHWAYS OF HISTORY

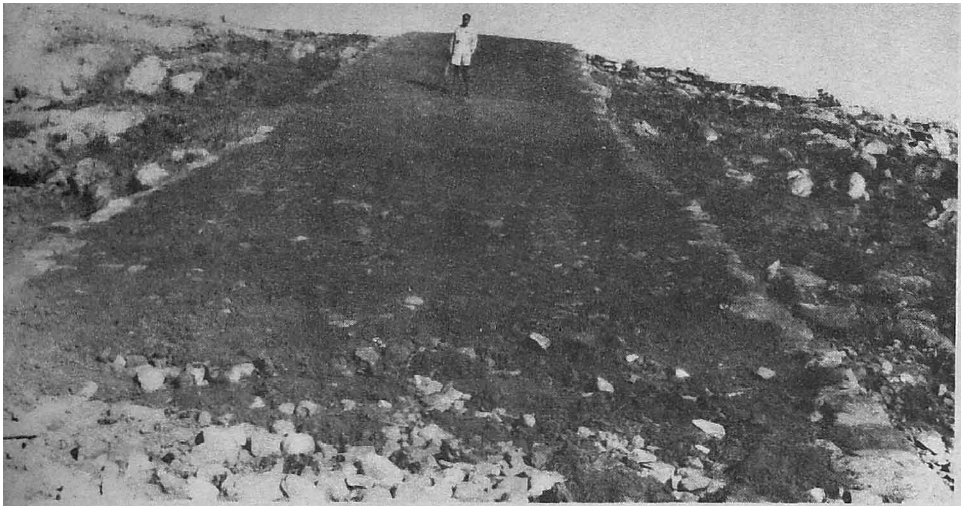
CHAPTER III

ANCIENT Indians, it appears, recognised the importance of roads. The excavations at Mohenjo-daro have revealed that they knew the art of building roads some 5,000 years ago. At Harappa has been discovered a miniature two-wheeled vehicle with the driver seated in front. This work of art, fashioned in copper is, perhaps, one of the oldest representations of the wheeled vehicle in the world.

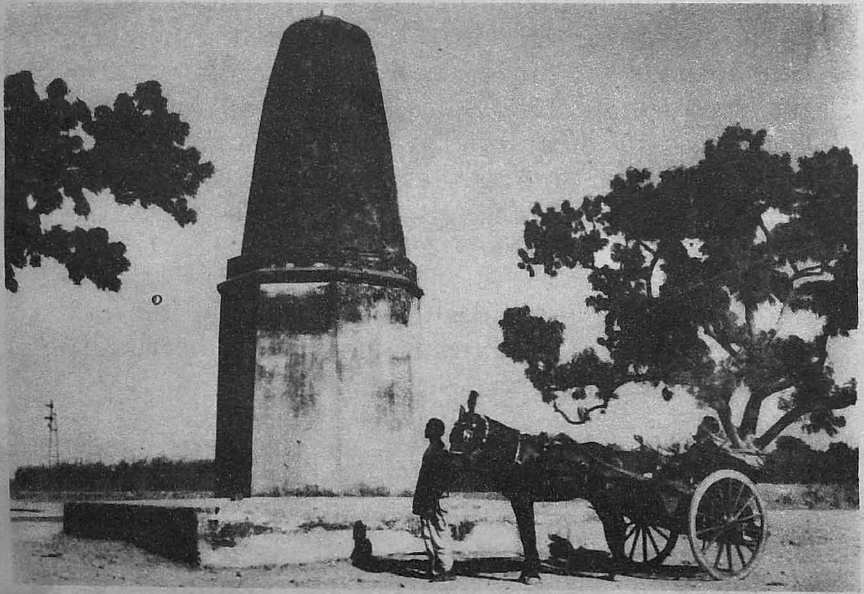
Coming to the Aryan period, we find that the ancient scriptures refer to the existence of highways, **Mahapatha.** A road built by King Bimbisara in the 6th century B.C. has survived to this day in Rajgir, ancient Rajagriha, in the south-east corner of Patna district. This road has an interesting history behind it. Hiuen Tsang tells us that when Bimbisara was about to visit the Buddha on Mount Gridhrakuta, he collected a number of men to accompany him. " They levelled the valleys and spanned the precipices, and with stone made a staircase about 10 paces wide and 5 to 6 *li* long." " This road of Bimbisara, " says Sir John Marshall, " which Hiuen Tsang traversed, still exists and still affords the most convenient footway through the jungle and up the hillside in approaching Gridhrakuta......It is built of rough and undressed stones like all the prehistoric walls of Rajagriha, and its width is from 20 to 24 feet which agrees well enough with the 10 paces of Hiuen Tsang."

Arthashastra, the well-known treatise on administration, gives a good deal of information on the subject of roads during the Mauryan period. Kautilya, the author of this learned treatise, laid down the width of roads for various purposes and various kinds of traffic in the following words:—

> " Chariot-roads, royal roads, and roads leading to **Dronamukha, Sthaniya,** country parts and pasture grounds shall each be four **dandas** (24 ft.) in width. Roads leading to **Sayoniya** (?), military stations (**vyuha**), burial or cremation grounds, and to villages shall be eight **dandas** in width. Roads to gardens, groves, and forests shall be four **dandas.** Roads leading to elephant-infested forests shall be two **dandas.** Roads for chariots shall be five **aratnis**; and roads for minor quadrupeds and men two **aratnis.**"



2300-year old road built by King Bimbisara in Rajgir, District Patna



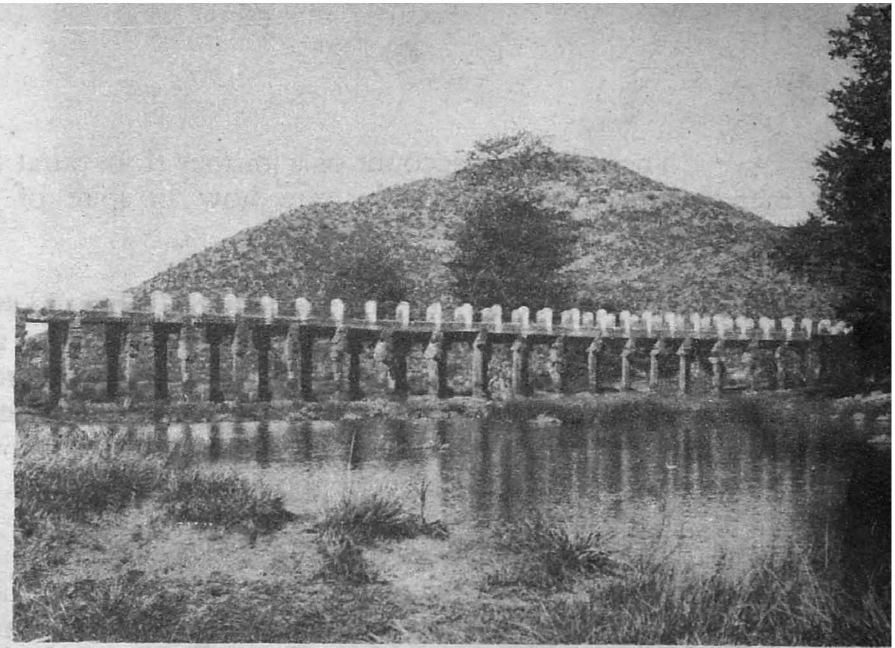
KOS MINAR, a Mughal milestone on the Agra–Sikandra road

Chandragupta Maurya (322-298 B.C.) had a department of communications to look after the public roads. Pillars, which served as milestones and signposts, were erected at regular intervals. A grand trunk road connected the North-West Frontier with the capital, Pataliputra, the modern Patna. According to the famous geographer Strabo, Eratosthenes and Megasthenes arrived at an accurate length of India, from east to west, from the register of stages kept on this grand trunk road.

Emperor Asoka, commanding a big sprawling empire, paid special attention to roads. One of his rock edicts carries the following inscription: "On the roads banyan trees were planted to give shade to men and cattle; mango gardens were planted at each half kos; wells were dug, and rest-houses were built for the comfort of the travellers." Fa-hein who came to India at the beginning of the 5th century A.D. thought highly of the rest-houses for travellers, which were provided on the highways.

Ibn Batuta who travelled in India in the 14th century has left an interesting account of a journey performed by Sultan Muh. Tughlaq from Delhi to Daulatabad. The journey was completed in 40 days. "From first to

last," writes Ibn Batuta, "the road is lined with willow and other trees so that a traveller feels that he is in a garden throughout this distance. Besides there are courier posts at a distance of every three miles."



Seventeenth century stone bridge across the River Cauvery at Sivasamudram, Mysore State

During the reign of the Emperor Sher Shah, roads were well maintained. The Tarikhi-i-Sher Shahi contains the following interesting description:

"For the convenience of poor travellers, on every road, at a distance of every two **kos**, he has made a **sarai**; and one road with **sarais** he made from the fort which he built in the Punjab to the city of Sunargaon, which is situated in the Kingdom of Bengal, on the shores of the ocean. Another road he made from the city of Agra to Burhanpur which is on the borders of the kingdom of the Dekhin, and he made one from the city of Agra to Judhpur and Chitor; and one road with **sarais** from the city of Lahore to Multan. Altogether he built 1,700 **sarais** on various roads. On both sides of the highways Sher Shah planted fruit-bearing trees, such as also gave much shade, so that in the hot wind travellers might perform their journeys under the shade of trees; and if they should stop by the way might rest and take repose."

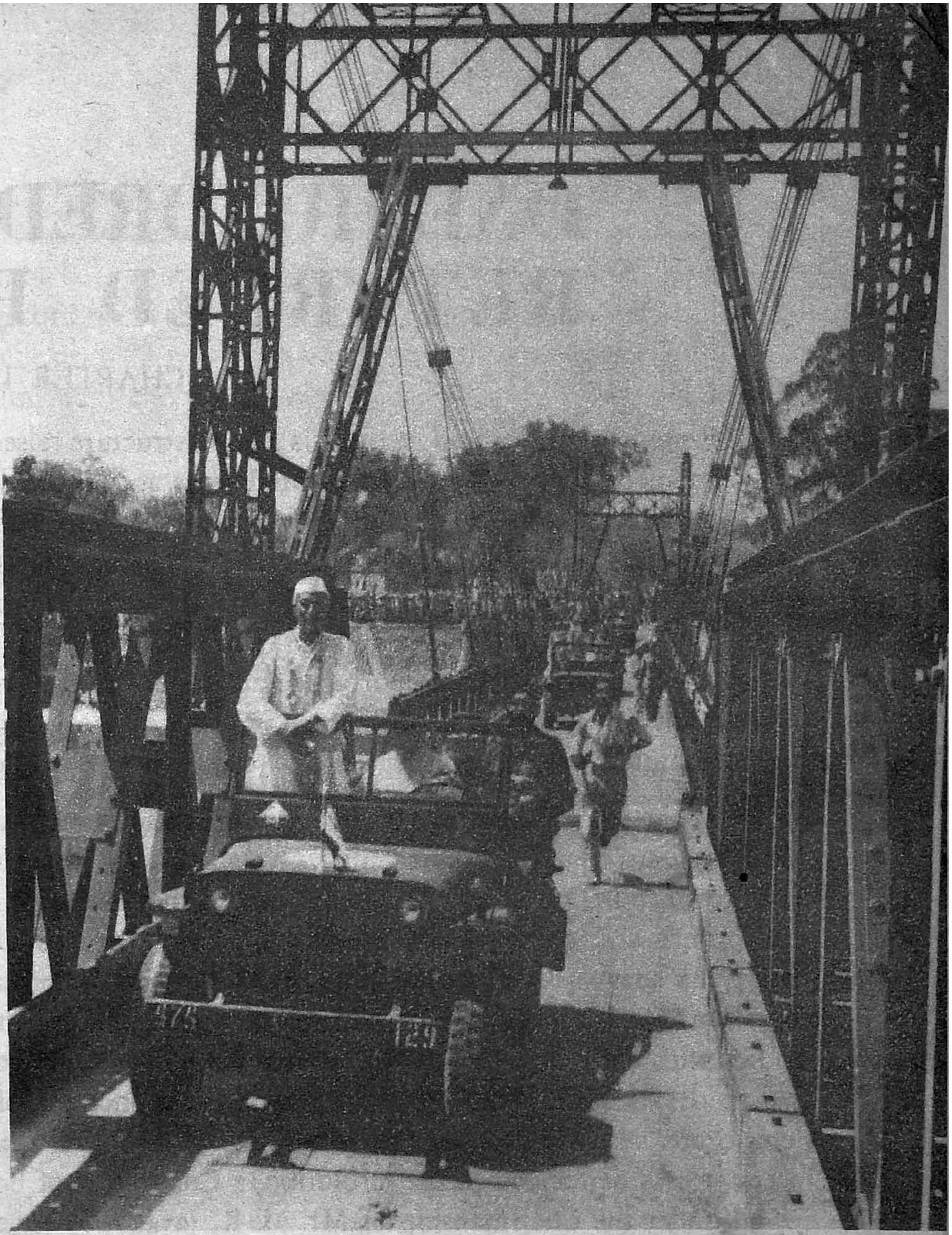
Road development continued under the Mughal rulers. The **Chahar Gulshan,** which was written in the 18th century, has given a list of 24 important roads which formed the net-work of road communication during the Mughal period. The first thirteen of these 24 roads which have been traced are (1) Agra-Delhi, (2) Delhi-Lahore, (3) Lahore-Gujrat-Atak, (4) Atak-Kabul, (5) Kabul-Ghazni-Qandhar, (6) Gujrat-Srinagar, (7) Lahore-Multan, (8) Delhi-Ajmer, (9) Delhi-Bareilly-Banaras-Patna, (10) Delhi-Kol, (11) Agra-Allahabad, (12) Bijapur-Ujjain, (13) Sironj-Narwar.

The following account of a journey from Surat to Agra undertaken by William Finch, an English merchant, will serve to illustrate how in spite of difficulties long distance travel was possible even in those days:

> " At Burhanpur the road left the Tapti and struck north-west for Mandu and Malwa, crossing the Satpura range and the Narbada river, and then ascending the steep scarp of the Vindhyas. The track was very bad, successive marches being described as 'stony and steep way,' 'stony troublesome way,' 'bad way,' and 'steep way;' while the ascent Mandu was 'up a steep stony mountain, having way but for a coach at most.' After Mandu there was one more bad stage, and then a good road to Ujjain."

The well-known traveller Tavernier, who lived in India between 1640-1667, took intense pleasure in travelling in a carriage drawn by trotting bullocks. The only difficulty of travel in those days was that with the advent of the monsoon traffic was brought to a standstill. During the hot weather fodder and water were difficult to get and this restricted the range of road travel.

The new Pathankot–Jammu road which links up Kashmir with India. Completed in record time, the road was opened by the Prime Minister on July 7, 1948



ONE HUNDRED YEARS OF RETARDED PROGRESS

CHAPTER IV

THE present road system of India is a superstructure raised on the old Mughal and other roads. Its development began about one hundred years ago under the auspices of the Government of India. Soon, however, the railways came on the scene. Speedy and economical beyond belief they attracted all the attention of the Government and roads came to be regarded as of local importance, a fit subject for devolution. The culmination of this lack of interest was reached in the Government of India Act of 1919, which transferred the subject to the provinces, and the Central Government ceased to concern itself with road development, except for roads of military importance and certain arterial roads in Indian States. The provinces in their turn placed the greater part of the road mileage in the charge of local bodies, taking direct responsibility for the maintenance and construction of only a strictly limited mileage.

At the same time as this devolution took place there was a revolution in transport in India. The World War I had ended and surplus military vehicles were cheaply available for civilian use in large numbers. Motor transport, represented mainly by buses, became a common feature on the principal roads throughout the country and on roads which had previously carried the bullock cart only. The combined action of the iron-tyred heavy bullock cart wheel and the fast moving pneumatic-tyred motor wheel, however, soon proved disastrous for road surfaces. Roads were wearing out fast, the cost of maintenance had risen, and the local bodies with their meagre financial and technical resources could not cope with the situation. The result was that road expansion could not keep pace with the increase of motor traffic, and the existing roads began to deteriorate. Public opinion was roused at last and found expression in a resolution of the Council of State in 1927. As demanded in the resolution, a Committee of both the chambers of the Central Legislature was set up under the Chairmanship of Mr. M. R. Jayakar to investigate and report.

The Jayakar Committee reported in 1928. Its main findings were that the onus of road development was passing beyond the capacity of provincial Governments and local bodies, that it was becoming a matter of national importance, and to that extent might be a proper charge on Central revenues. The Committee recommended that the Centre should assist co-ordinated development by making annual block grants to provinces from out of a Central Road Fund built up by a petrol tax surcharge of two annas per gallon. The Central Road Fund accordingly came into being with effect from March, 1929.

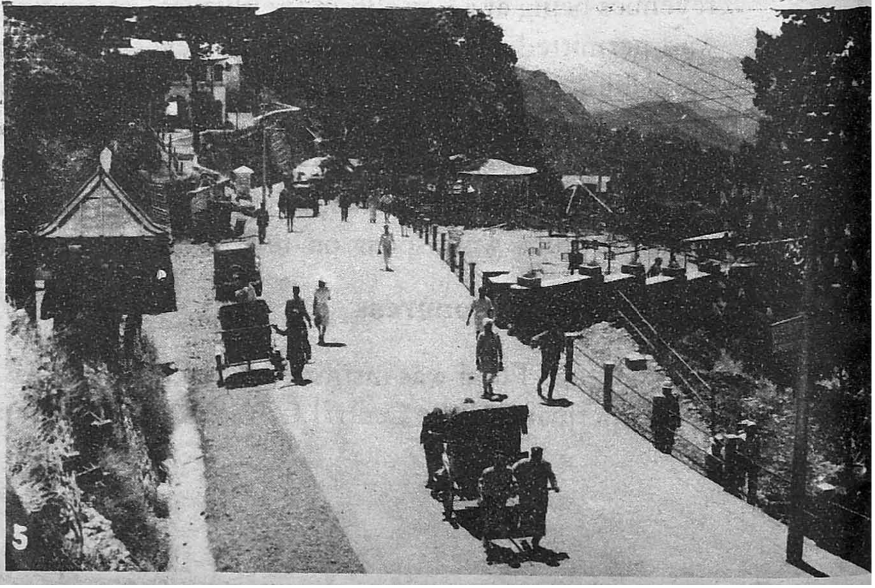
The Road Fund

The Road Fund was to be administered by the Central Government with the advice of a standing committee of the Central Legislature. Part of the fund—one-sixth—was to be reserved for Central administration, research, intelligence and grants for undertakings of special or all-India importance. The balance of the fund was recommended for allocation to the provinces and States according to the consumption of petrol in each administrative unit. Block grants to the provinces, from the fund, were intended to augment provincial allotments for road development. Depression, however, followed the creation of the fund and provincial revenues being at a low ebb in the thirties, diversion of the Fund to the maintenance of roads and other purposes was permitted. On the whole, however, the improvements made possible, up to 1939, as a result of Road Fund allocations were considerable. In the provinces and Centrally administered areas 382 new bridges or causeways were built at a cost of 253 lakhs, while Rs. 42 lakhs were spent on repairs and improvements of existing bridges and culverts. Some 1,230 miles of concrete and other modern surfaces and 1,500 miles of fair-weather roads were also built, and 22,00 miles of existing metalled roads were improved. In addition about 22 lakhs were spent on miscellaneous improvements of various kinds.

Indian Roads Congress

The Road Fund was instituted in the first instance for five years only. Later, however, when it became more or less permanent, the Central Government took steps to promote the creation of a semi-official body known as

EVOLUTION OF ROAD



1 The village track which bullocks alone can negotiate

2 The earth road, an improvement upon the village track, is a fair-weather road. Rains reduce it to slush and mud

5 And so to the concrete road. Though expensive to build it is economical in the long run

ARCHITECTURE

3 The water-bound macadam is better than the earth road, but it wears out quickly under the impact of 'mixed' traffic and requires constant repairs

4 The tarred road is free from many defects associated with the macadam road but it is liable to excessive tracking

6 Concrete haunches encourage segregation of traffic. The centre of the road is left free for fast moving vehicles

the Indian Roads Congress. The Congress came into being in 1934. Membership of this body is open to qualified engineers dealing with roads. Others interested in road development are also entitled to become associate members on payment of a special subscription. The constitution of the Roads Congress is designed to effect the pooling of professional knowledge and experience without the formality of official inter-provincial conferences at which the delegates feel cramped owing to the fear that they may be committing their respective Governments. The Congress has now about 1,000 ordinary besides some associate members, and holds its sessions at regular intervals. Proceedings, containing a mass of valuable information on roads, are circulated to all the members. It has a number of Committees, who go into such questions as bridge specifications, research and experiments, test track and soil research. It is thus a unitary professional body with a clear federal constitution dealing with a subject which is technically within the jurisdiction of the provinces. It has played and will continue to play an important role in the future development of roads in India.

Change of Outlook

The position when India entered the War in 1939 was that the provinces were solely responsible for roads, but owing to the economic depression of the pre-war period they lacked funds to promote road development, while the Central Government's interest in road development was confined to making block grants from out of the Central Road Fund. The World War II, particularly the Japanese offensive, proved that the arrangement was unsatisfactory. Intensive efforts were necessary to develop roads of strategic importance not merely in operational areas but generally all over India. But where was the money to come from? The provinces were not in a position to finance road building. So the development of roads of military importance was undertaken by substantial grants from the Defence Estimates. The entire outlook on the problem of road development then underwent a change. It was realised that the country must have an efficient arterial road system, and that this system could be kept up to the mark only if the Centre took it over for development and maintenance.

THE NAGPUR PLAN

CHAPTER V

EXPERIENCE of World War II and the realisation that a balanced road system was vital to comprehensive post-war economic development of the country turned the thoughts of India's statesmen and engineers to road planning. A conference of Chief Engineers was convened by the Government of India at the instance of the Indian Roads Congress. The Conference, an important landmark in the history of Indian roads, met at Nagpur in December 1943 to consider ways and means of future road development. The outcome of its deliberations was a ten-year plan of road development better known as the Nagpur Report.

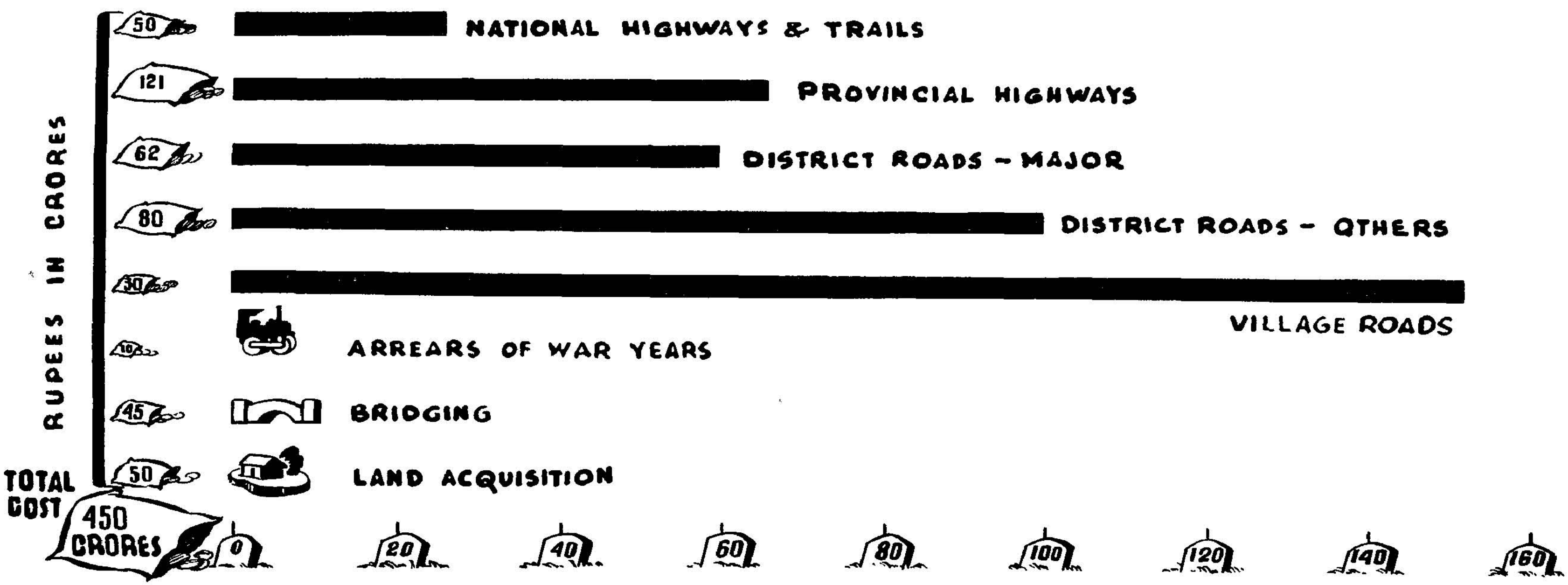
Classification of Roads

The Conference has classified roads under the following heads: National Highways, Provincial or State Highways, Major District Roads, Minor District Roads and Village Roads. The National Highways as the word implies will connect capitals of provinces and States, ports and foreign highways, and constitute the main arteries of communication in the country. They will also include roads of strategic importance. The provincial or State Highways will be the main trunk roads of a province or State. Major District Roads will connect areas of production and markets with either a highway or a railway. They will also form the main links between headquarters of neighbouring districts. Minor District Roads and Village Roads will mostly meet the requirements of rural population.

Balanced Development

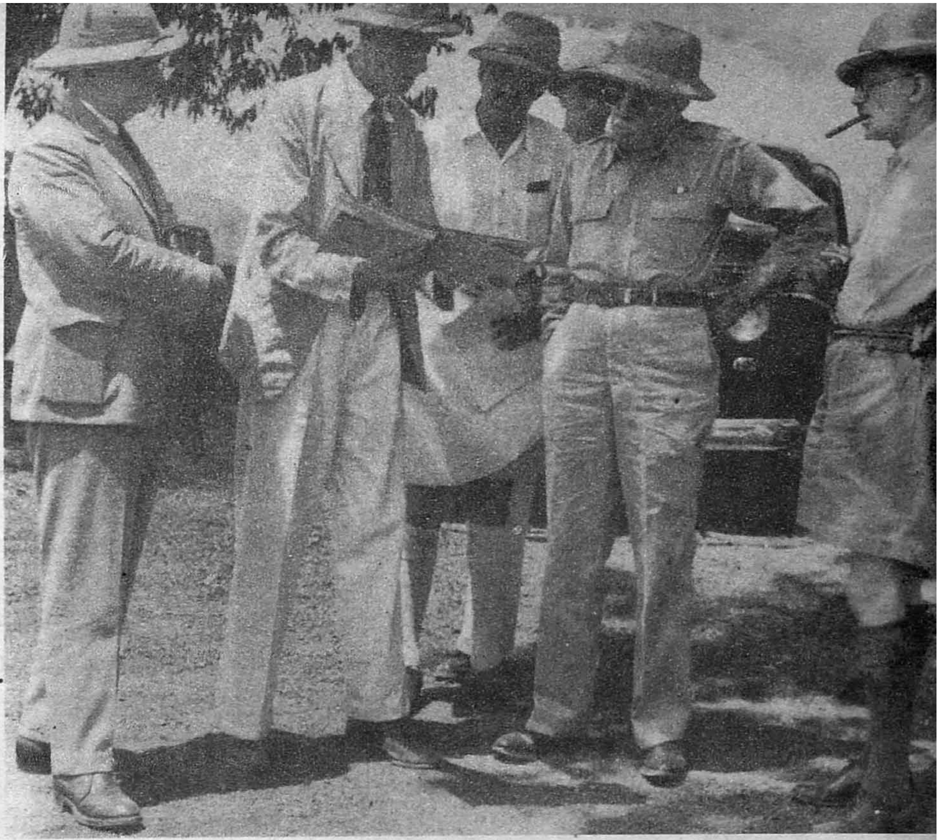
The plan is based on the estimated requirements of the country for the first 20 years of the post-war period. Its objective is a balanced development of all classes of roads so that every village in a well developed agricultural area is brought within easy reach of a main road. A network of main roads is provided for in this plan connecting towns and large villages. Minor district and village roads are to be developed on a corresponding scale. The plan involves the improvement of the existing roads as well as new construction. The total mileage and cost of the plan are as under:

NAGPUR PLAN



	Length (miles)	Cost (Rs.)
National Highways	22,000	47 crores
National Trails	3,000	3 ,,
Provincial Highways	65,000	121 ,,
District Roads—Major	60,000	62 ,,
District Roads—Others	100,000	80 ,,
Village Roads	150,000	30 ,,
Arrears of war years	..	10 ,,
Bridging	..	45 ,,
Land acquisition	..	50 ,,
	400,000	448 crores or 450

Indian Road engineers explain a scheme to the American road experts, who visited India about a year back



The Nagpur Report also recommends the assumption, by the Central Government, of complete financial liability covering both fresh development and annual maintenance for the roads designated as National Highways. These are to be administered by an impartial Road Board, also to be responsible for obtaining balanced road development throughout the country. The Central Government is also to assist actively in the co-ordination of road development planning, and provide Central road research, Central standards specifications, and technical advice covering all aspects of road construction and maintenance. Central assistance in the planned procurement of road-making machinery, cement, and bitumen is recommended. The Central Government is also to arrange for the training of engineers, and devise machinery for advising on legal problems arising out of land acquisition and prevention of encroachments.

FORGING AHEAD

CHAPTER VI

THE Government of India have already implemented many of the recommendations of the Nagpur Conference and have assumed, with effect from the 1st April, 1947, complete financial liability for the construction and maintenance of every road which is classified as a National Highway, subject to the conditions that:—

(i) The Central Government will be the final authority to decide the inclusion of any road in the National Highways system. It will also decide the standards to which the different parts of the National Highways system would conform and the priority of construction;

(ii) Expenditure on works will be subject to the approval of the Central Government;

(iii) While the provincial Public Works Departments will normally be employed, the Centre reserves the right to employ its own agency for construction and maintenance;

(iv) While proprietary right over the road assets remain vested in the provincial Governments, with corresponding legal liabilities, the provincial Governments will regulate traffic, prevent encroachments, control ribbon development, restrict access to National Highways and tax betterment (or unearned) value in accordance with the public interest and upon the advice of the Central Government—the Centre will not, however, receive any payment on account of betterment;

(v) No tolls or other imposts will be levied on motor vehicles paying tax, and all non-commercial Central Government motor vehicles will be exempt from provincial and local taxation;

(vi) Provincial Governments will take special care to foster development of district and village roads; and

(vii) Road transport will generally be controlled in conformity to an agreed code of practice. In taking decisions which rest with them on the foregoing conditions, the Central Government will act in close consultation with the provincal Governments.

Expenditure Targets

The expenditure targets tentatively held in view for National Highway works during the first five years are:

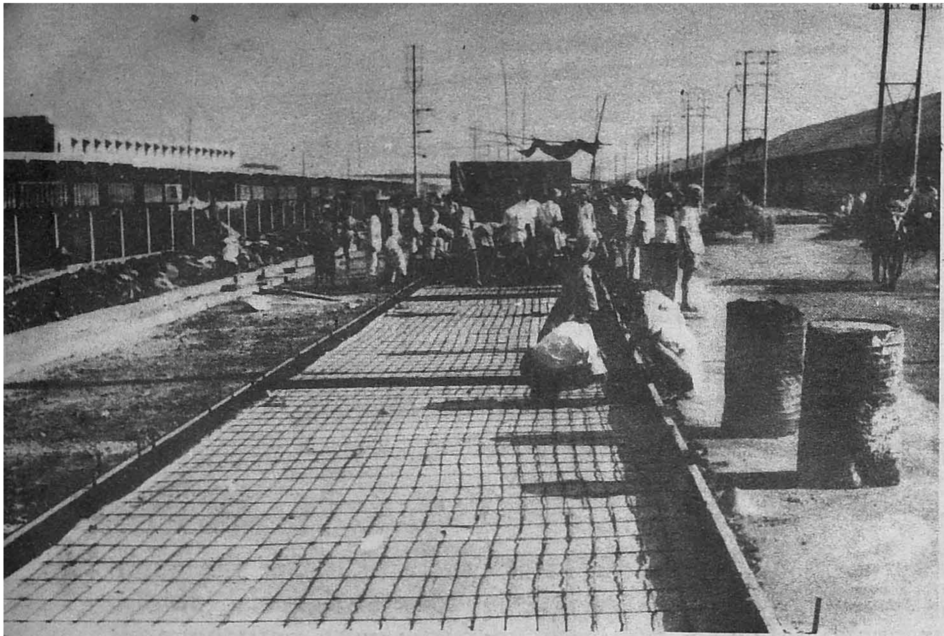
(a) for new construction and development	Rs. 23.50 crores
(b) for annual maintenance during the 5 year period	6.50 ,,
	30.00 crores

Under the present constitution the States do not come within the fiscal system or under the same administrative set up as the rest of India and are, therefore, not entitled to receive Central financial aid for National Highways save to the extent found to be unavoidable in the case of States with poor financial and engineering resources. They are however expected to conform generally to the conditions mentioned above. The position of the States in this respect, under the new Constitution for India, which is on the anvil of the Constituent Assembly, has yet to be clarified.

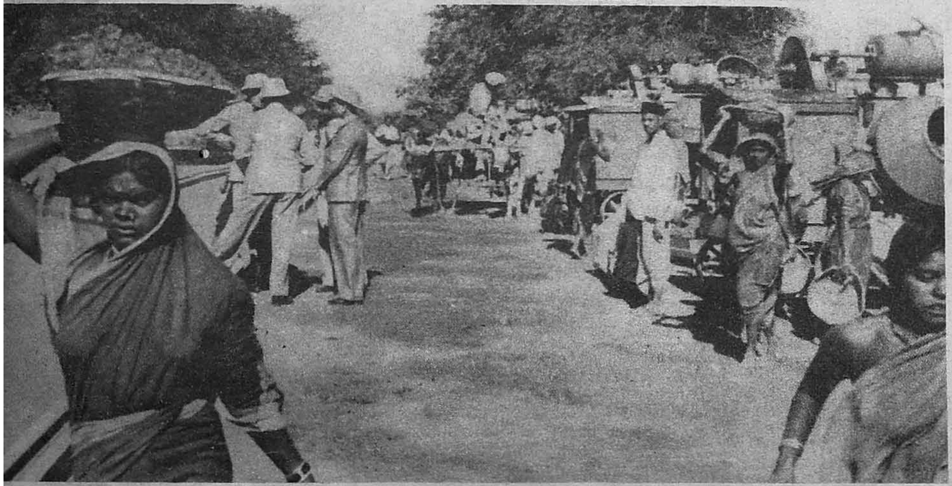
All India fiscal conditions necessitated the scaling down of the National Highway plan as envisaged in the Nagpur Report from about 25,000 miles to about 18,000 miles for undivided India. For post-partition India the mileage contemplated is approximately 14,000 miles. About 500 important bridges are also to be constructed under the scheme, 22 of which will exceed 3,000 feet in length.

The proposed National Highway routes generally follow the existing trunk roads which are already largely surfaced, though there are a number of large rivers that are without permanent bridges. The exact alignments in respect of many sections of the National Highway system have not yet been firmly fixed and may not be fixed for some time in the case of sections low in priority for construction, as all resources are being concentrated on works high in priority. The surfaces vary from cement concrete through various types of black top down to ordinary macadam, depending on the traffic requirements and the resources of the province or State concerned.

For new development works, subject to the availability of constructional resources, bridging of unbridged streams ordinarily has the highest priority. In the case of road works, development of length comes



Road-building in progress



Concrete mixers are being increasingly used in road building

first, widening and improvement of layout comes next and higher class surfacing will be undertaken last. The bridging of existing roads to proper standard has over-riding priority.

Works Undertaken

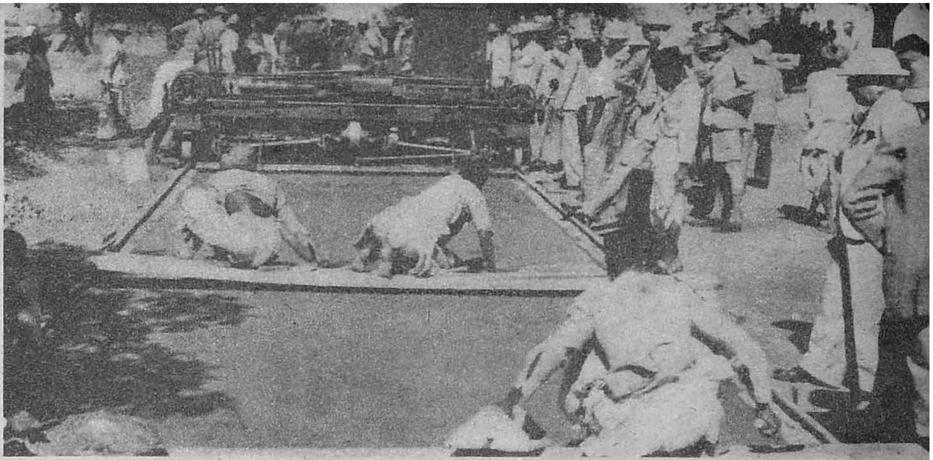
Four major bridge works on National Highways, *viz.*, Kathjuri and Kuakhai (in Orissa), Poonpoon and Barakar (in Bihar), the total estimated cost of which is over Rs. 70 lakhs, are already in progress, and an expenditure of nearly Rs. 47 lakhs is expected to be incurred on them during 1948-49. Work on 35 major bridges (estimated to cost Rs. 3½ crores) is to be started during the current financial year, involving an expenditure of about Rs. 75 lakhs. With regard to road projects, it is expected that work on over 150 miles of new roads involving an expenditure of Rs. 85 lakhs roughly and work on improving nearly 550 miles of roads at an estimated expenditure of Rs. 190 lakhs is being undertaken during the current financial year.

Provincial Plans for Roads other than National Highways

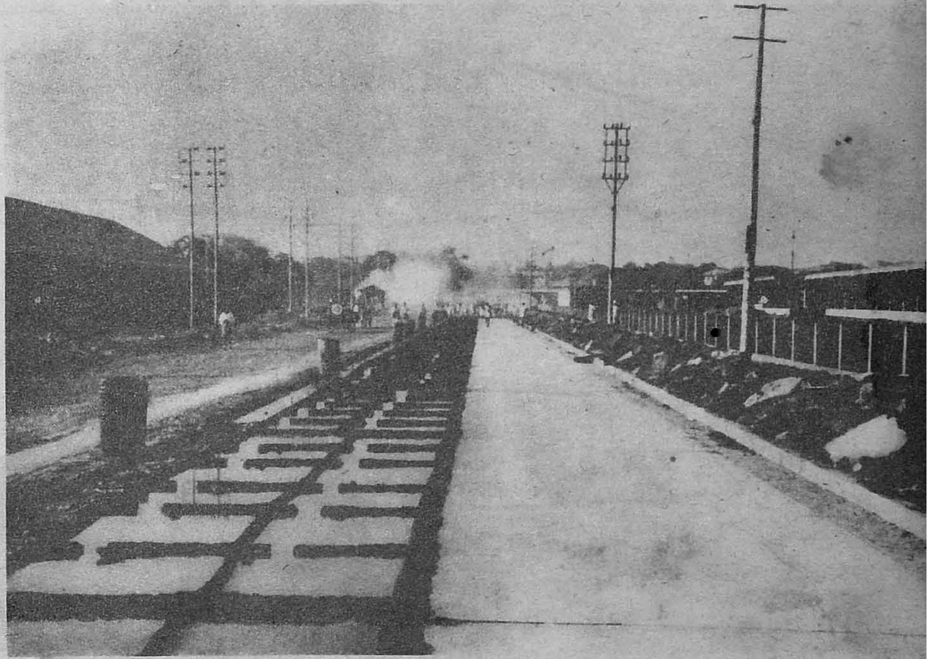
The provincial plans for the development

of roads other than the National Highways are included in the overall provincial five-year plans. The Roads Organisation of the Government of India has to advise on the sufficiency of each plan for roads both in relation to the overall provincial plan as well as in respect of the composition of the road plan itself. An analysis made last year revealed that it is desirable to make a provision of between 15 and 25 per cent for roads in the overall provincial plans; and that a provision of between 30 to 40 per cent should be made for rural roads within the road plan itself.

Since last year, all the provincial five-year plans have gone or are undergoing revision; the complete picture of the revised 5-year road plans is not yet available. Financial help to the provinces from the Centre will be available for the overall five-year plans and not specifically for road development. Analysis of the preliminary provincial plans has, however, indicated that nearly 20 per cent of the total expenditure contemplated on all heads of development in the five-year plans is likely to be spent on roads other than the National Highways. This proportion is considered satisfactory.



Modern finishing machines give concrete roads a smooth surface



The finished road is cured under water

Where concrete roads meet in Patiala

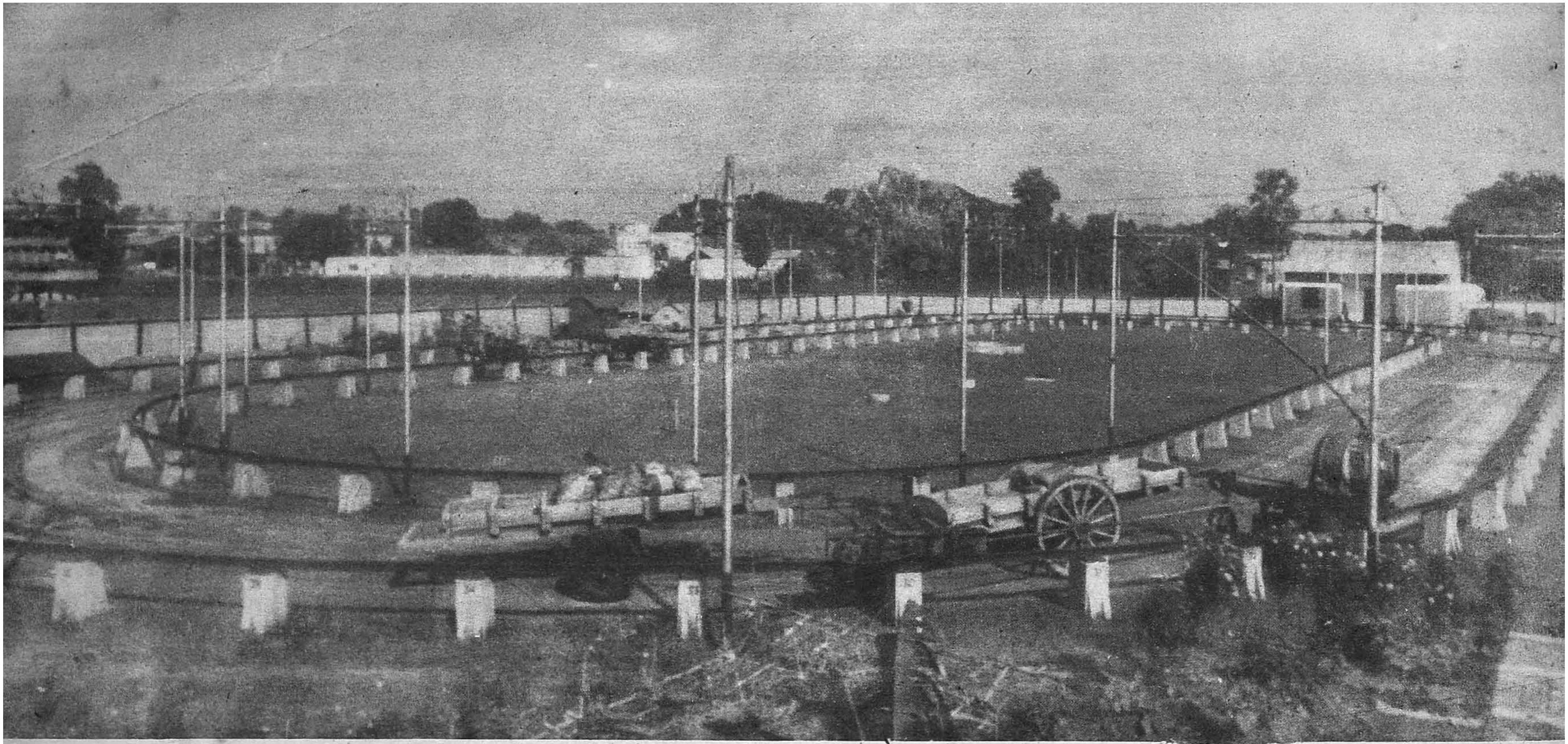
THE CENTRAL ROADS ORGANISATION

CHAPTER VII

THE planning and execution of the National Highways scheme obviously require a competent and adequate team of expert engineers. Considerable progress has already been made in building up an efficient Roads Organisation at the Centre under the Consulting Engineer to the Government of India (Roads). The organisation has expert staff of Planning Officers, Engineer Consultants, experts in bridges, standardisation, road machinery and plant, and the necessary junior officers, draughtsmen and others. The Planning Officers assist the provincial and State Public Works Departments and advise the Central Government in the planning of National Highway alignments, and the siting and designing of major bridges. These senior officers also assist in the development of standards and designs, and give technical advice on projects contemplated or in progress. The Engineer Consultants organisation, which is being built up with the approval of the provinces, maintains liaison between the provincial Public Works Department and the Centre in the planning and development of works.

The Roads Organisation prepares the annual working programmes of National Highways works and revises or reviews them periodically in respect of each administrative unit. It also keeps the long-term (or five-year) targets for each continuously in view and reshapes them in small or large measure according to financial and other exigencies. The final stage is that of the development of the works projects, their technical scrutiny and approval and financial sanction by the Central Government.

In addition to these activities which directly relate to National Highways, the Roads Organisation is tackling a host of other problems concerning road development in general, grants to provincial Governments for development of roads other than National Highways, road research, road statistics, bulk procurement of machinery, and overseas training of road engineers.



The Test Track at Calcutta to study the effects of 'mixed' traffic on different road surfaces

Road Research

The diversity of India is tremendous. The country extends from the sub-tropics in the south to the cold heart of Asia in the north. Its soil conditions also vary from place to place. In Bengal and Assam, for example, it is difficult to build an all-weather road, while it is comparatively easy to construct such highways for traffic of all kinds in the East Punjab and Madras. In Orissa floods are known to have caused widespread damage to roads in the past. In the Gangetic plains and in the East Punjab the difficulty of finding cheap road metal is a great obstacle to road development. The coast of Bombay is split up by many rivers and creeks. The Central Provinces and Deccan enjoy the benefits as well as the drawbacks of the black cotton soil. In the north the Himalayas are clad in snow for the greater part of the year making roads across the border

impassable and dangerous. While this variety is advantageous in many ways it creates problems for road-builders. They have to suit roads to the climate, physical features, and soil requirements of each area.

A single concrete track in a village near Bombay. The track is used by bicycles, hand carts and bullock carts the year round

Then, there is the problem of mixed transport. Before motor transport arrived on the scene, road construction and maintenance had been a fairly simple affair. With the advent of the motor car, however, new ideas had to be worked out and applied to the changing conditions of transport. The Road Fund helped some research to be carried out. Much was learnt as a result of experiments on the behaviour of various road surfaces under the impact of mixed traffic. Perhaps, the most important piece of research was the drawing up of the Bridge Code. Another notable achievement was the evolution of the concrete trackway for rural roads, and of different methods of segregating slow and fast moving traffic. In some places entirely separate trackways or traffic lines have been provided for bullock cart traffic on the approaches of towns. These cart strips have proved very popular and in any future plan of road development, segregation of traffic near the big cities in the interest of public safety, health and convenience will play an important part. Experiments conducted so far in soil research are expected to result in considerable economy in the construction of hard-surface roads by increasing the bearing power of the soil. By the time of the outbreak of World War II, a great deal of scientific information had been amassed but the testing of the various methods evolved had not kept pace with the theoretical work done.

A Central Road Research Institute with suitable laboratory equipment and testing appliances, including a Road Test Track, is being set up at Delhi under the auspices of the Council of Scientific and Industrial

A subway in Delhi to avoid a rail-road crossing

Research. Some of the provinces are planning to set up smaller road research testing stations as part of their development plans. Research must find application if full benefit is to be derived from it. So the Central Roads Organisation is setting up a co-ordinating machinery whose task will be to co-ordinate, assimilate and disseminate the results of work done in the various institutes having regard to the needs of the country.

Much valuable work has also been done by the Indian Roads Congress, particularly on such subjects as the design of bridges, highways widths, pavements, soil stabilisation, statistics and economic surveys. A survey census of about 400,000 vehicles of different types passing the Howrah Bridge in Calcutta during a fortnight has recently been completed, including the study of the origin and destination of such traffic. Non-official studies by the Indian Roads and Transport Development Association have also been undertaken in Bombay to determine the value of good roads.

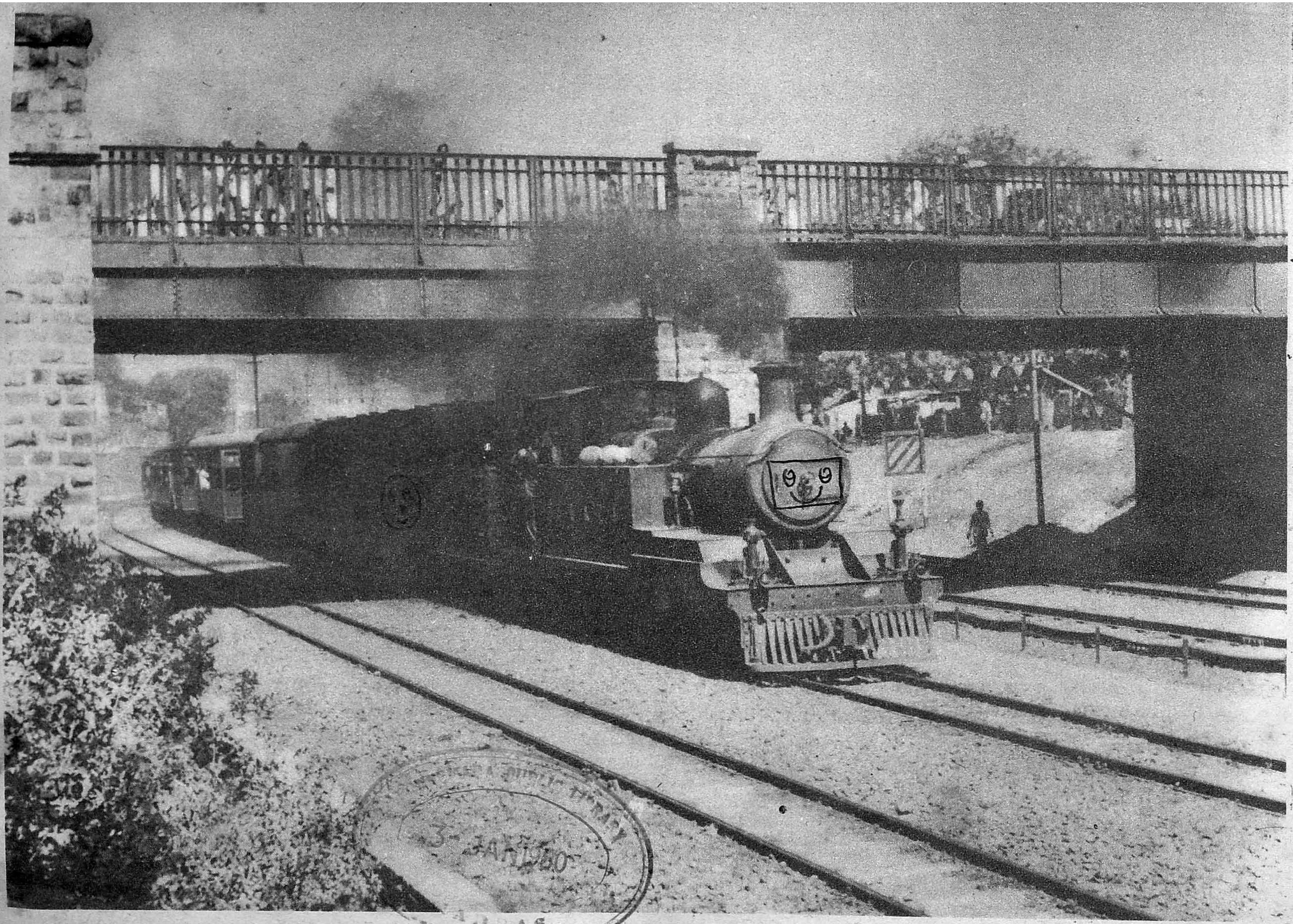
Road Making Machinery

Shortage of rollers is one of the biggest obstacles in the execution of road development plans. Immediate requirements in respect of rollers result from war-wastage, lack of imports during the six years of

war and the magnitude of road construction now planned. It is estimated that an initial supply of about 2,300 rollers will be needed during the next four years or so. To meet this demand an order for the manufacture of 1,500 rollers has been placed on firms in India. Initial supplies will, however, have to come from abroad and bulk supply has been ordered from the United Kingdom and the U.S.A.

Overseas Training of Personnel

To overcome the shortage of trained personnel and to give our engineers experience of the developments in other countries the Government of India have adopted the practice of sending deputations overseas to acquire knowledge of modern theory and practice of highway engineering and administration. Two delegations, which included representatives of the provinces and some of the States, have already toured the United Kingdom and the U.S.A. The reports submitted by the delegations show that the visits have been of considerable value in broadening the experience and outlook of the delegates. It is expected that those who have benefitted by the overseas experience will act as a leaven in improving the efficiency of their colleagues and subordinates.



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Another device to avoid a crossing

COST AND BENEFITS

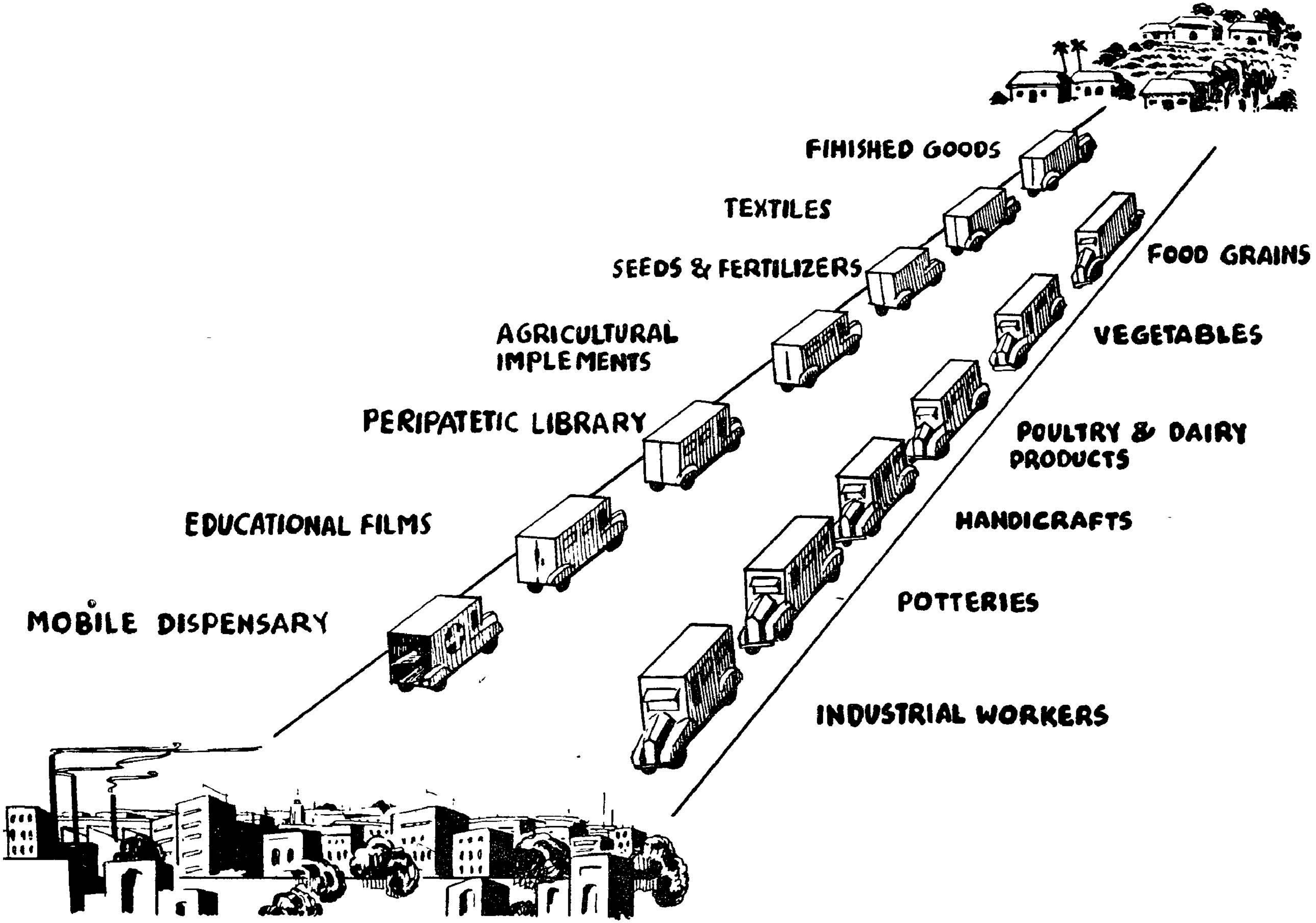
CHAPTER VIII

ROADS cost money, plenty of money. Is investment in roads justified?

It is not quite as easy to calculate the return on investment in roads as in the case of hydro-electric or irrigation projects. Nevertheless it is common knowledge that it saves money to transport goods over good roads. It has been calculated that if it costs 7 annas a mile to operate a motor vehicle over bad roads it costs only 4 to 5 annas to operate it over good roads. The saving in the case of bullock carts is not so obvious but it is there. Over good roads the bullock cart can carry heavier loads; the wear and tear is less, so that the cart lasts longer; the time taken is shorter, so that the farmer can put his bullock to some other use in the field longer.

And imagine all the benefits that will accrue to the cultivator as a result of road development. With improved facilities to market his produce in good condition and speedily he will begin to produce larger quantities of perishable commodities which fetch good profits. Higher income will enable him to obtain the requirements of modern agriculture, and amenities of life for himself and his family. His children will be able to go to school. Mobile health and medical units will carry medical benefits to his doorstep. Mobile libraries, newspapers and journals will bring him news and views from all parts of the world. Motor traffic will make movement between towns and villages easier and speedier. The cultivator will visit the towns frequently, exchange ideas with others, see schemes of development being implemented all round, and will be prompted to work hard, apply new ideas and methods to agriculture and thus better his lot. Large tracts of land watered by rivers, but uncultivated will be brought under the plough.

The paucity of transport facilities is at present a big obstacle in the rapid expansion of our industries. In Assam, Bihar and other places we have rich mineral deposits not being fully utilised, because the regions in which they are found are not well connected with centres of production. Road expansion will open such


FINISHED GOODS
TEXTILES
SEEDS & FERTILIZERS
AGRICULTURAL IMPLEMENTS
PERIPATETIC LIBRARY
EDUCATIONAL FILMS
MOBILE DISPENSARY
FOOD GRAINS
VEGETABLES
POULTRY & DAIRY PRODUCTS
HANDICRAFTS
POTTERIES
INDUSTRIAL WORKERS

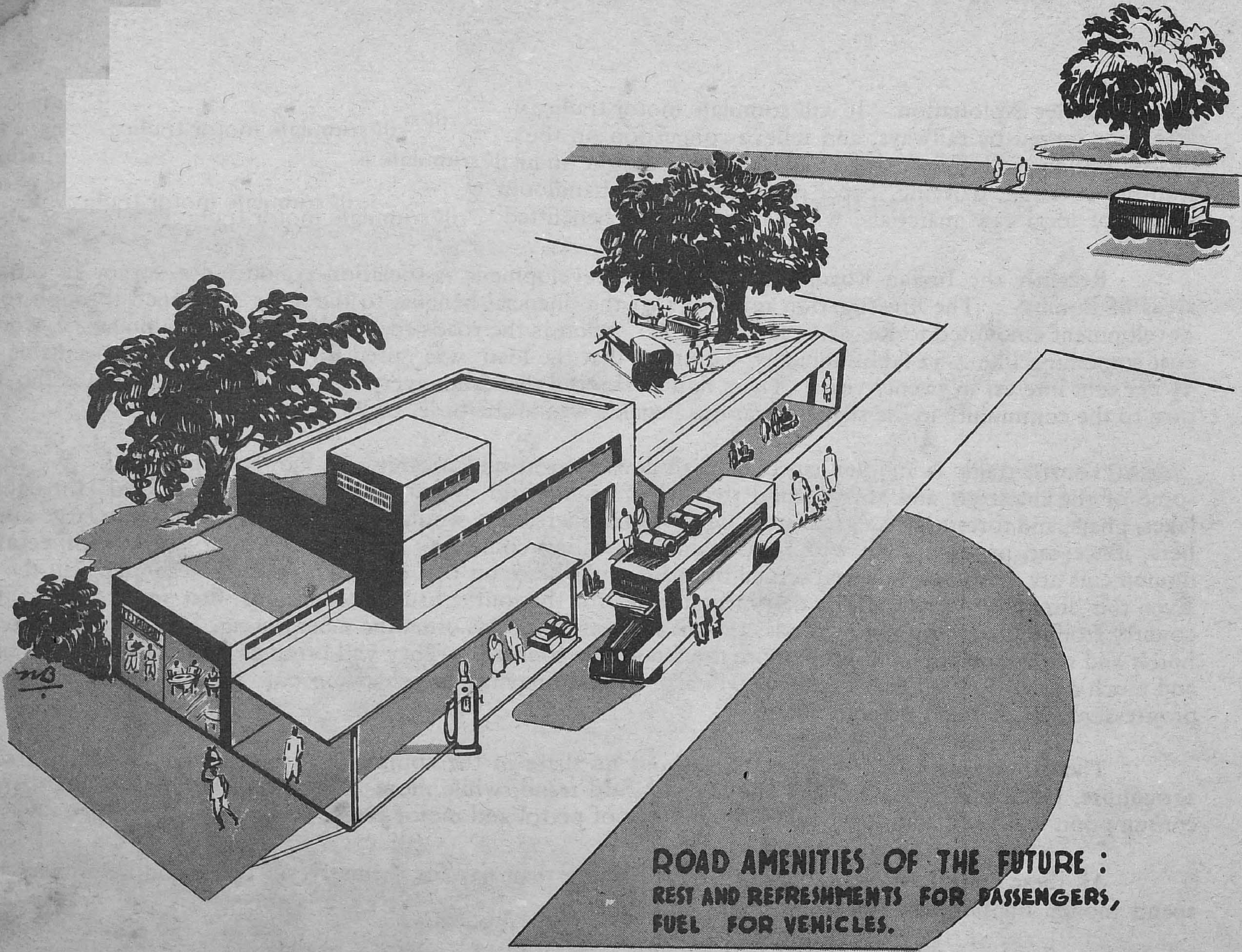
areas to fuller exploitation. It will stimulate motor traffic, which will enable speedier movement of goods in areas not served by railways, and relieve congestion on the over-worked railway system in other areas. Industrialization will follow road development. Light industries, such as sugar-manufacture, dehydration, fruit-preservation, dairying, paper-manufacture and handloom weaving, which are dependent upon the cheap supply of local raw materials, will be particularly benefitted.

Recently the Indian Roads and Transport Development Association conducted a survey in certain areas of Bombay. The investigation revealed that the financial benefits to the areas concerned through road development amounted to Rs. 11.97 lakhs per year, whereas the roads required, including maintenance, would cost something like 4.32 lakhs annually, assuming that the loan was raised for the initial cost redeemable at 3½ per cent interest in twenty years. These figures showed that from every 100 rupees spent on roads the return to the community in the shape of various benefits was of the order of Rs. 277.

Tourist traffic is another aspect of road development which cannot be lightly disposed of. We have some of the finest art and architectural treasures of the world in our country. Our snow-clad Himalayas, lakes, ghats, and forests have a great attraction for foreigners, who would like to visit our country in large numbers, if we can provide them with reasonable travelling comforts. Our beauty spots and architectural monuments are, however, not well served by roads with the result that comparatively a few people visit them. Even this limited tourist traffic is detrimental to us, for the tourist usually forms his first impression of the country from the condition of its roads, and the first impression is often the most lasting. Better roads, good hotels and more amenities will bring more tourists to the country. They will bring us not only good money and much needed foreign exchange, but will also be instrumental in enhancing our reputation abroad as a progressive, efficient and modern nation.

The Government too will not be without its share in the community's prosperity. Revenue from agriculture, trade and commerce will show an upward trend, while more motor vehicles and greater petrol consumption will yield additional sums in the shape of petrol and motor taxes.

All these considerations indicate that roads more than pay for themselves. It is good investment to spend money on building roads.



ROAD AMENITIES OF THE FUTURE :
REST AND REFRESHMENTS FOR PASSENGERS,
FUEL FOR VEHICLES.

THE PICTURE TODAY

CHAPTER IX

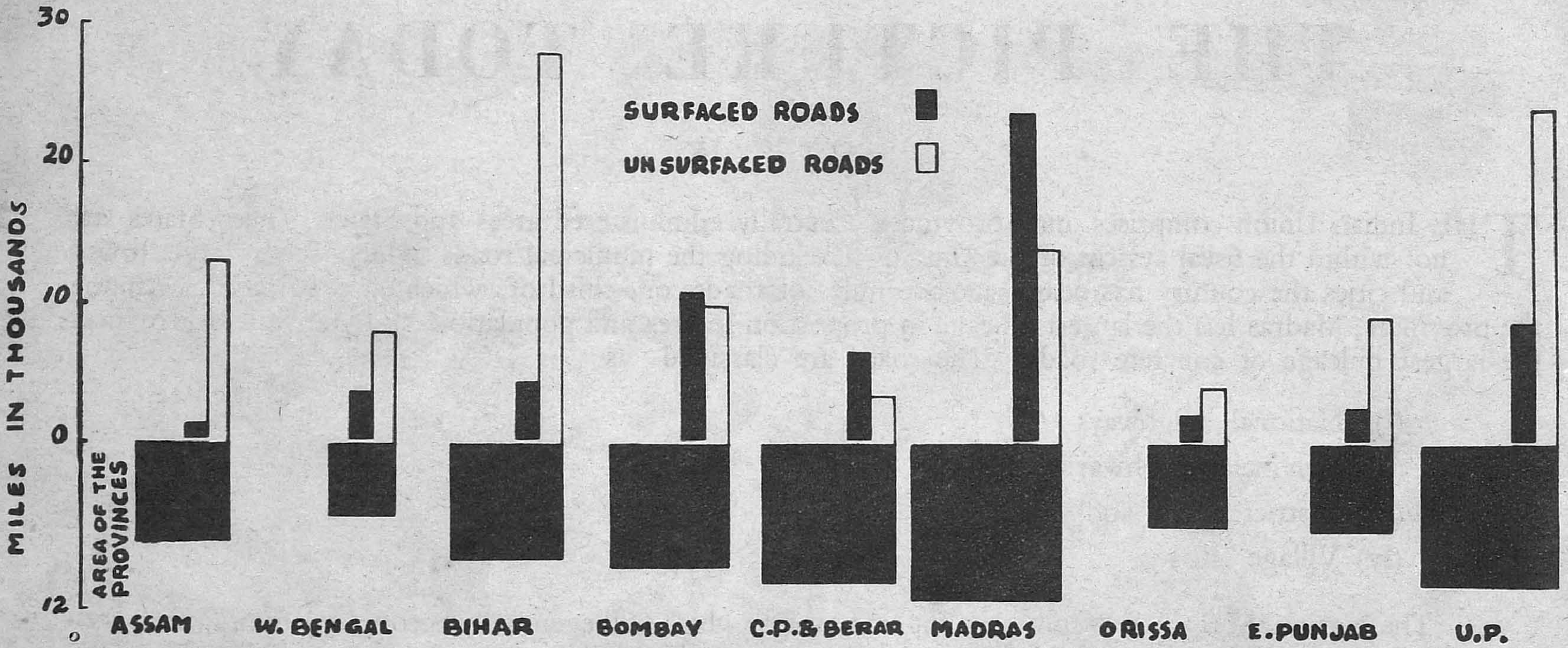
THE Indian Union comprises nine provinces, Centrally administered areas and States. The States are not within the fiscal system of the Union. Excluding the municipal roads which serve large towns and cities the country has nearly 240,000 miles of roads, one-third of which are surfaced. Among the provinces, Madras has the largest mileage in proportion to area and population, and the United Provinces the largest mileage of concrete roads. The roads are classified as

(i) National Highways
(ii) Provincial Highways
(iii) District Roads and
(iv) Village Roads.

The **National Highways** constitute the framework which will eventually become a network of modern roads for the economic welfare and the defence of the country. The Highways traverse the length and breadth of the country, connect capitals of provinces and States, large towns, industrial areas and ports. They also offer connections with foreign countries such as Burma, Nepal and Tibet. On the eve of partition the National Highways system comprised 18,000 miles of roads of which 2,800 miles were in the States. The National Highways are mostly surfaced.

Then there are **Provincial Highways,** which are the main arteries of commerce within a province or State. They connect with the National Highways or with the highways of adjacent provinces or States, district headquarters and important cities.

Next below in individual traffic capacity are **District Roads** which serve areas of production and markets, connecting them with one another or with highways and railways. They take traffic into the interior

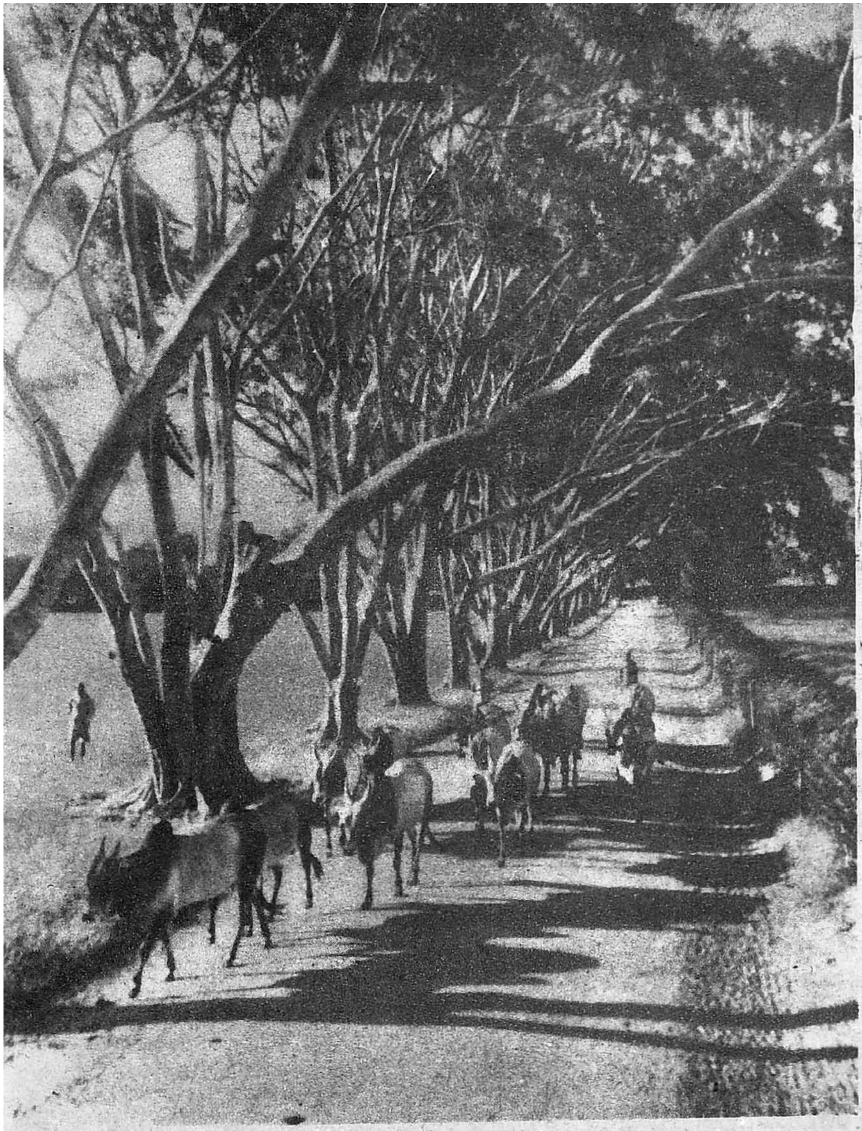


of each district. Many of the district roads are at present unmetalled and sometimes remain closed for long periods during the rainy season.

Last in the category are **Village Roads** connecting villages and groups of villages with one another and with the nearest district road, highway, railway or river ghat. Some of the existing village roads are not much better than mere tracks.

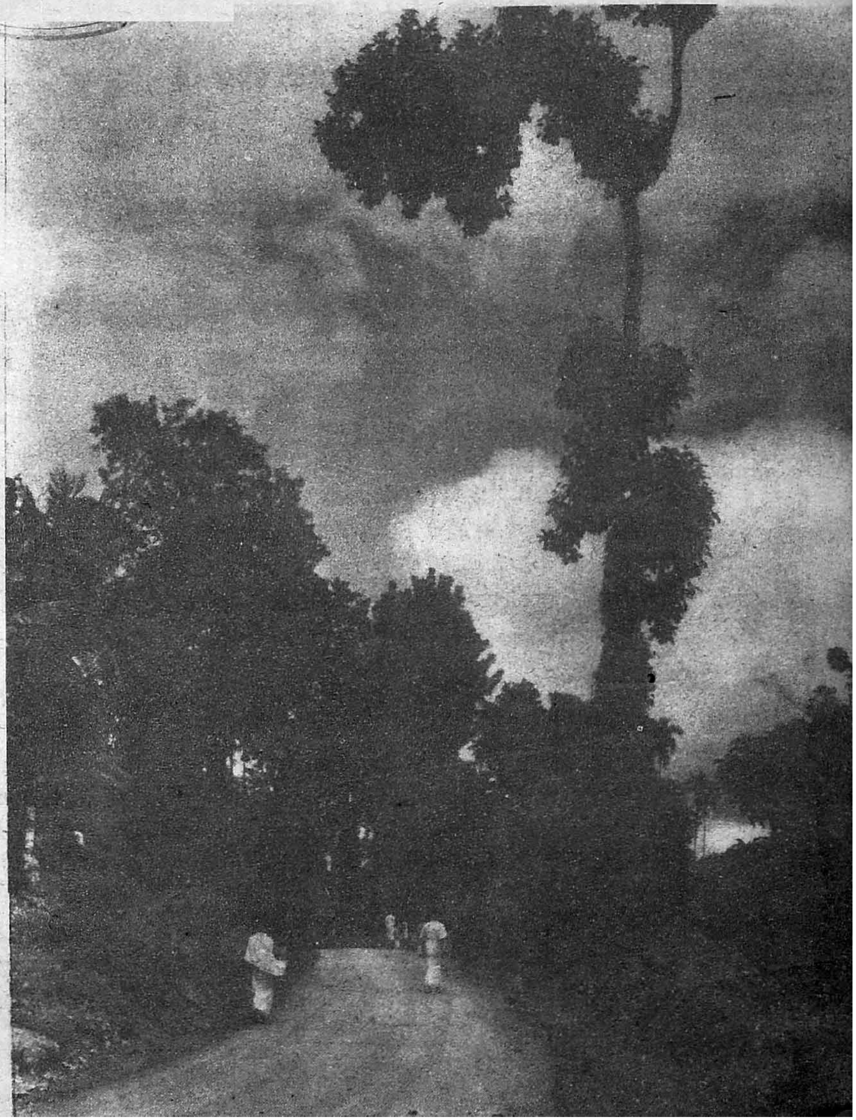
Road Administration

Since 1919 the provinces have been solely responsible for the maintenance and construction of roads. The Central Government's interest in roads was confined to sanctioning block grants to the provinces from



A village road in South India

A district road



out of the Central Road Fund. This grant, however, being inadequate, no large-scale road development could be financed through this source alone. The war underlined the necessity of Central direction and control over the road system, and with the consent of the provinces the Central Government has, with effect from 1st April, 1947, assumed additional financial responsibility for the construction and maintenance of every road which is accepted by the Central Government as a National Highway. Constitutionally, however, the status of National Highways is that they remain provincial roads for which the Central Government has assumed financial responsibility. The Subject "National Highways" has now been included in the Federal list of the draft constitution of India, and if this item is finally incorporated in the new constitution the Centre will have the necessary legal and constitutional authority for undertaking the construction and maintenance of the National Highways system.

Calcutta–Amritsar Grand Trunk Road near Banaras

The provincial highways are generally under the charge of provincial Public Works Departments. The Department has under it several Circles each responsible for a definite region. The Circles are administered by Superintending Engineers. Each Circle is further divided into Divisions, and each Division is sub-divided into sub-Divisions.

The district and village roads have for many years been the responsibility of the local bodies. Generally speaking, however, this arrangement has not been a success. The responsibility is too big for the scanty resources of the local bodies. The professional isolation of District Engineers, insufficiency of funds, and the

Mules are the only means of transport on the snow-clad highways of the Himalayas

rapid increase during the last 40 years of the traffic on rural roads are some of the reasons for the poor condition of our rural roads. Spasmodic efforts, in the past, to improve roads when money could be found were followed by periods of inactivity when funds were not available, with the result that whatever improvement had been effected first was nullified later. Water-bound macadam, the best that the local bodies could provide, wore out quickly under the combined action of the motor vehicle and bullock cart traffic, and required constant repairs which were prohibitive; while the earth roads, adequate for motor vehicles, would not stand up to bullock cart traffic. There was a vicious circle which the local bodies were unable to break. This can be broken only by a vigorous policy of improving roads as well as the vehicles which use them. The local bodies are ill-equipped to undertake this task, hence some of the provincial Governments are contemplating action to transfer control over the district and village roads to the provincial Public Works Departments.

Method of Execution of Works

Road and bridge works have in the past been generally executed through contractors, while maintenance is undertaken by departmental labour. For various reasons the contractors employed on road works have been mere labour contractors and suppliers of materials rather than comprehensive contractors. Generally speaking they do not own their own plant which is usually owned by the Government and is let out to those whose tenders are accepted.

THE BULLOCK CART AND THE MOTOR VEHICLE

CHAPTER X

INDIA has sometimes been represented, by foreign journalists and writers, by the picture of a slow moving bullock cart. And we are sometimes told that India is passing from the age of the bullock cart into that of the atomic energy. The impression that the bullock cart represents a medieval influence is both unhappy and untrue. The bullock cart has not only played a very important and useful role from the earliest time of recorded history in this country but its future contribution to the economic development of India is bound to be considerable. It is, perhaps, the best suited vehicle to the peculiar agricultural conditions obtaining in this country and will continue to serve as a primary means of transport in the absence of other means of cheap transport.

What it means to Indian Transport System ?

According to a rough estimate there were 87 lakhs of carts before the war and they carried one hundred million tons of goods every year. The capital invested in the carts was estimated at about 261 crores of rupees as against 69 crores in motor lorries. These figures indicate the important role the bullock cart has played in the transport system of India. When we remember that it provided employment for about a crore of men and about double that number of cattle, we get a clear picture of its place in India's economy.

It was at one time thought that the antiquated cart, which had survived centuries of change, might not get a chance to live long in the era of motor transport. This expectation has not materialised because motor lorries can operate successfully only round about industrial areas. The fact is that the cart is cheap for short hauls, the motor lorry is cheap for medium hauls, and the railway is cheap for long hauls. And the bullocks which have no work after ploughing and harvesting are over, have to be used for moving goods during the rest of the year.

A convoy of carts transporting grain

A wayside halt

A few facts about Bullock Cart

The majority of bullock carts in India are rural in origin. Though strong and of durable material, they are crudely constructed and unsprung. The most common cart has a wheel of the ordinary light rim and spoke design which has an iron tyre shrunk on to hold it together. The width of the tyre varies, and as iron costs money the tyres are usually very narrow. The tyre protects the wheel rather than the road.

A simple but important fact about the bullock cart is that the bullocks plod exactly in front of the wheels. It is the bullocks that steer the cart and not the driver. By instinct, the bullock follows any track or line it sees before it. This results in excessive "tracking" when cart after cart pass along the same line on the road. Experiments with "tar" roads

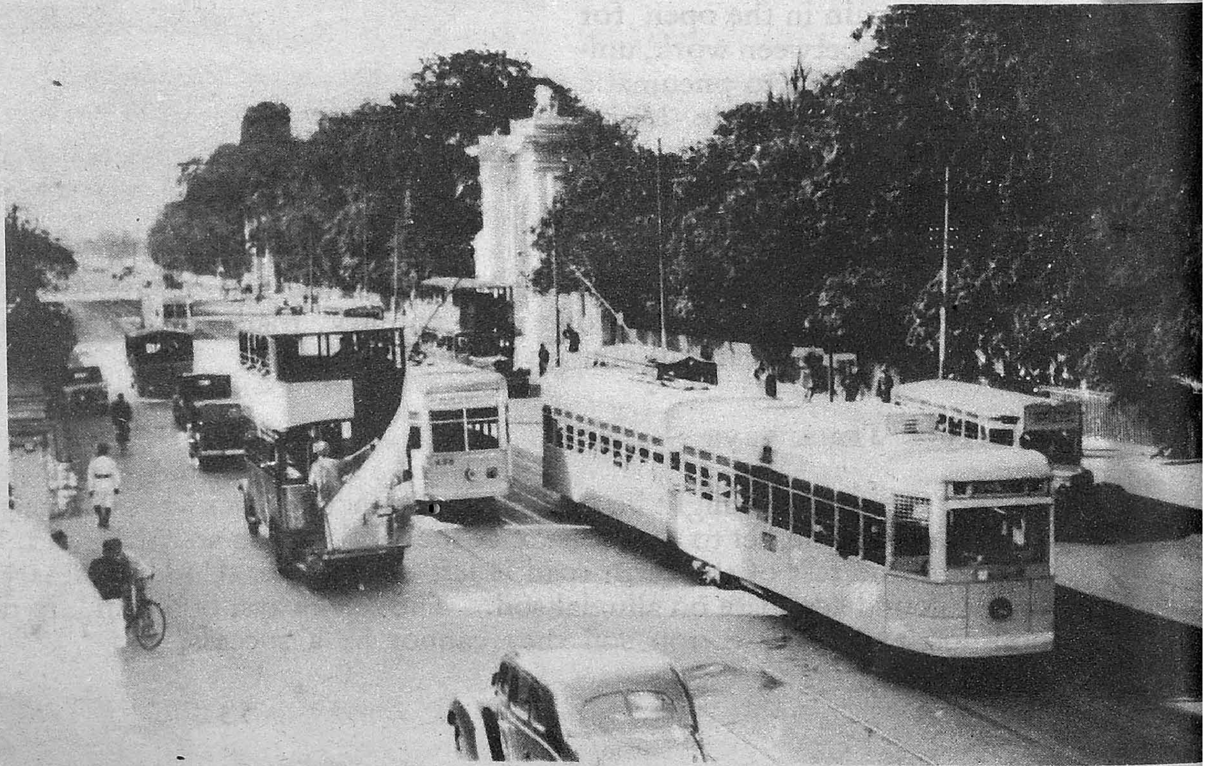
have resulted in the surface being cut to ribbons. Pneumatic tyres offer a good alternative but the equipment is too expensive for the poor farmer. Generally, as most of the carts have to remain in the open for long periods between work, universal conversion to pneumatic tyre seems impracticable. Moreover, the rubber-tyred cart would be a failure over the present village and minor district earth roads. If the villager takes to the improved cart with pneumatic tyres he needs better roads. We are, thus, face to face with the problem: "you cannot improve the country roads till you reform the bullock cart, and you cannot reform the bullock cart till you give it better roads."

A modern bullock cart on pneumatic wheels

Concrete Trackways

The solution might lie in the use of concrete trackways. Trials have been made with concrete tracks, each two feet wide, set to the measure of the local cart on an earth road. The bullocks take to the tracks instinctively and the rest of the earth road is left unaffected. Under ordinary rural conditions a six-inch track slab may be found adequate on alluvial soil. The trackways, however, are not a universal cure. In areas of heavy monsoon and black cotton soil they cannot be a success.

The 'victoria' plies between your house and the station



Modern transport in Calcutta

The Motor Vehicle

With the advent of motor vehicles in India, the economics of road transport have undergone a revolutionary change. The macadam road, which answered perfectly the needs of the bullock cart, lost its old durability and had to be replaced by the expensive bituminous road. In many towns motor transport has displaced the bullock cart though the latter has definite advantages for short distances.

Motor vehicles in India kept steadily increasing in number till 1939 when the war broke out putting a stop to fresh imports. Their number in 1944-45 stood at 142,172. In relation to road mileage, India has only one motor vehicle for every two miles of road, while Great Britain has more than 14 vehicles and the United States about 10 vehicles for every mile of road.

A phenomenal increase in the number of motor vehicles is expected in the near future and our road development plans have to make provision for the needs of the future motor traffic.